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ABSTRACT

This document contains selected papers from the 24th annual conference of the North American Association for Environmental Education (NAAEE). Papers and reports from the NAAEE Sections and other special workshops are presented first, followed by contributed papers, and finally a section providing background information on the NAAEE. Various topics of the presentations include arts in environmental education, biodiversity monitoring, environmental communication, environmental issues, sustainable environmental education programs, urban outreach, forest service, environmental justice, evaluation, rural outreach, curriculum development, school land labs, environmental competency, environmental action, integrated curriculum, partnerships and innovations, teacher thinking and practice, weatherizing houses and alternative fuels, mentoring, growth management and land use, undergraduate environmental science, conflict resolution, peace corps, global environmental change, threatened and endangered animals, children's literature, professional development, remote sensing and geographic information system technologies, academic training, environmental activities, citizenship and political controversy, public policy, environmental ethics, environmental awareness, recycling, environmental management, environmental education research, zoos and conservation centers, language and culture, multidisciplinary environmental science, children's perceptions, Australian landcare approach to environmental education, live animals, program evaluation, environmental education in vocational education, water education, preschool programs, and environmental risk education. (JRH)

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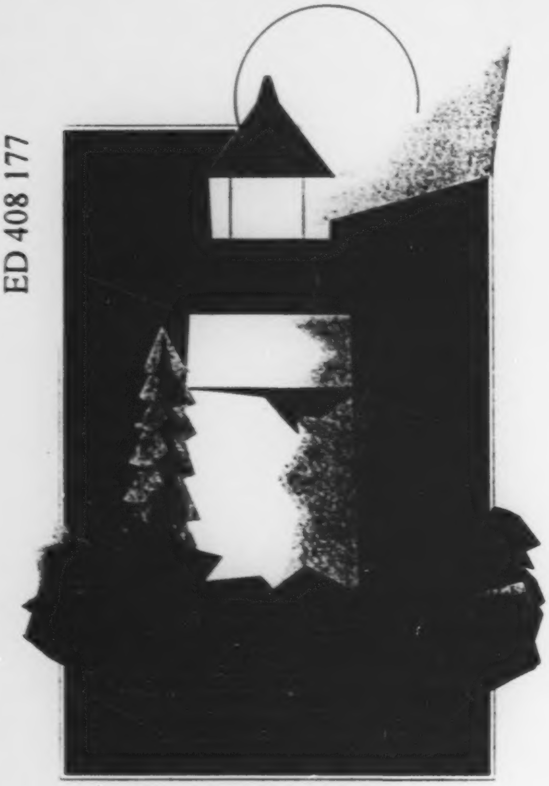

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Selected Papers

from the 24th Annual Conference
of the
North American Association for Environmental Education

September 15-20, 1995
Portland, Maine

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edited by
D. Scott Slocombe

NAAEE
NORTH AMERICAN
ASSOCIATION FOR
ENVIRONMENTAL
EDUCATION

Gaining New Insights - Building on Experience

Selected Papers from the
24th Annual Conference of the
North American Association for Environmental Education

Portland, Maine
September 15-20, 1995

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NAAEE
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EDUCATION

About the North American Association for Environmental Education

NAAEE is a network of environmental professionals and students working in the field of environmental education throughout North America and in over 45 countries around the world. Since 1971, the Association has promoted environmental education and supported the work of environmental educators. There are many environmental interest groups, and many organizations dedicated to improving education. NAAEE uniquely combines and integrates both of these perspectives, and takes a cooperative, nonconfrontational approach to promoting education about environmental issues.

The Association is made up of people who have thought seriously over lifetimes about how people become literate concerning environmental issues. NAAEE members believe education must go beyond consciousness-raising about these issues. It must prepare people to think together about the difficult decisions they have to make concerning environmental stewardship, and to work together to improve, and try to solve, environmental problems.

NAAEE recognizes the need for a coherent body of information about environmental issues. Its members also recognize that information and analysis are only part of an effective education program. To be truly effective, this body of knowledge must be integrated into all aspects of the curriculum and into all types of educating institutions for the widest array of audiences.

In order to translate theory into reality, and provide tangible support for environmental education and environmental educators, NAAEE engages in a variety of programs and activities. Some examples are the annual conference at varying North American sites, an extensive publications program, the Environmental Education Training Institute, the VINE (Volunteer-led Investigations of Neighborhood Ecology) Network, the Environmental Issues Forum (EIF) program, the NAAEE Policy Institute, the Environmental Education and Training Partnership (EETAP), and NAAEE's National Project for Excellence in Environmental Education.

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Table of Contents

Table of Contents i
Preface vii

Symposium Papers and Reports 1

Non-Formal Section Workshop - EE: Getting to the "Art" of it All
James N. Bull 2
Philosophy of Putting the Arts in Environmental Education
James N. Bull 6
Global Briefings Symposium: Commentary on the Papers
John H. Perkins 10
Linking the Global Network of Long-term Biodiversity Monitoring with Research and Training
Francisco Dallmeier 13
Process and Strategies for Environmental Communication in North America
Tiahoga Ruge 15
Environmental Issues and Education: A Canadian Perspective
J.W.B. Stewart 19
Symposium Overview: Questions of Hope in Environmental Education
Peter Blaze Corcoran 24
Symposium Overview: Working with Teachers to Build Sustainable EE Programs
Peggy Britt 27
Symposium Overview: Reaching Urban Audiences
Karen Hollweg 32
Urban Outreach and the US Forest Service: Northeast and Midwest Examples
Teri Heyer 34
The Natural Guard: A Project Funded by the USDA Forest Service
Diana E. Edmonds 38
The National Fish and Wildlife Foundation's Urban Initiative and a Premier Example of its Funded Urban Projects
Kathleen Pickering, Alex Corbluth, and Jeff Cole 41
Reaching Urban Audiences: Small Group Process Report
Marta Cruz Kelly 45

Contributed Papers 49

The Theatre of the Environment - Curriculum Design for Environmental Justice
Robert Abrams 50
Special Projects: A Sparkplug for EE
Carol Adkins 56

"GIVE WATER A HAND" SYNERGISM: ALLIANCES FOR EE PROGRAMS
Elaine Andrews and Kadi Row 60

EVALUATING SUSTAINABILITY PROJECTS
John H. Baldwin 63

ENVIRONMENTAL EDUCATION FOR MEXICAN RURAL COMMUNITIES
Lizbeth Baqueiro 67

USING RUBRICS TO REVIEW ENVIRONMENTAL EDUCATION PROJECTS
Pat Barron, Kelly Jacobs, and Diane Cantrell 72

THE METACOGNITIVE MODEL FOR ENVIRONMENTAL EDUCATION CURRICULUM DEVELOPMENT
Margaret B. Bogan 75

"WINDOWS ON THE WILD" - MATERIALS FOR TEACHING BIODIVERSITY
Judy Braus and Margaret Pennock 80

HABITATS FOR LEARNING: A NEW LOOK AT SCHOOL LAND LABS
Diane C. Cantrell 81

WAYFINDING: THE ROUTE TO ENVIRONMENTAL COMPETENCY
Cynthia Carlisle and Robert D. Bixler 85

A SUMMARY OF THE STATUS AND NEEDS OF ENVIRONMENTAL EDUCATION IN WISCONSIN K-12 SCHOOLS
Randy Champeau, Phyllis Peri, Dan Sivek, and Dennis Yockers 89

CREATING COMMUNITY WITHIN ENVIRONMENTAL EDUCATION
Cheryl Charles 99

LIFE PATHS INTO EFFECTIVE ENVIRONMENTAL ACTION
Louise Chawla 102

ENVIRONMENTAL EDUCATION: THE PERFECT TOOL TO INTEGRATE ACROSS CURRICULUM
Pei-Jen Chen 109

SUSTAINING INVOLVEMENT IN LOCAL ENVIRONMENTAL ISSUES
Delia Clark and Susan Clark 115

ENVIRONMENTAL STUDIES PARTNERSHIPS AND OTHER INNOVATIONS: A UNIVERSITY LEVEL ES WORKSHOP
Lori R. Colombo, Douglas O'Reilly, and Jacqueline Deegan 121

EXPLORING COMMON GROUNDS FOR ENVIRONMENTAL EDUCATION
Sabiha S. Daudi 126

STUDENT TEACHERS AND ENVIRONMENTAL ISSUES: EVALUATING THEIR INTENDED BEHAVIORS
Christopher G. Gayford and Patrick J. Dillon 133

MOVING ON FROM THE ELDERS
Annette Greenall Gough 141

TEACHER THINKING AND PRACTICE IN ENVIRONMENTAL EDUCATION: ISSUES OF RESEARCH METHOD
Paul Hart 146

WEATHERIZING INNER CITY LOW INCOME HOUSES/ALTERNATIVE FUELS VEHICLE EXPO
Bob Hubert 149

STUDENT-PRODUCED VIDEO PROGRAMS ON ENVIRONMENTAL HEROES AND HEROINES BROADCAST OVER LOCAL CABLE ACCESS TELEVISION
Thomas R. Hudspeth 150

THE ROLE OF MENTORING IN ENVIRONMENTAL EDUCATION
Katherine James and Cheryl Riley 153

GROWTH MANAGEMENT AND RURAL LAND USE DECISIONS: EDUCATING AND INVOLVING THE PUBLIC
Eric Jorgensen, Robin Kozloff, and Joan Wright 158

UNDERGRADUATE ENVIRONMENTAL SCIENCE IN BANGLADESH
Cub Kahn 162

ENVIRONMENTAL EDUCATION AND CONFLICT RESOLUTION
Mary Jo Larson 164

PEACE CORPS AND ENVIRONMENTAL EDUCATION
Mary Jo Larson 167

UNDERSTANDING GLOBAL ENVIRONMENTAL CHANGE
Betsy A. Leonard 170

LOCAL DISCOVERY, GLOBAL UNDERSTANDING
Luis Malaret, Douglas Potter, and Judith Cradler 173

A SUCCESSFUL ENVIRONMENTAL ENTERPRISE: CURITIBA - THE ECOLOGICAL CAPITAL OF BRAZIL
Zióle Zanotto Malhadas 186

THREATENED AND ENDANGERED ANIMALS: THE EXTENDED CASE STUDY AS A METHOD OF ENVIRONMENTAL INSTRUCTION
William C. McBeth 189

INTEGRATING CHILDREN'S LITERATURE WITH HANDS-ON SCIENCE TO TEACH ABOUT THE ENVIRONMENT
Richard J. McCloskey, Shirley Wright, and Jamie Seeger 193

LESSONS LEARNED ABOUT PROFESSIONAL DEVELOPMENT FOR EE TEACHER EDUCATORS
Martha C. Monroe 197

THE USE OF REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM TECHNOLOGIES IN AN EE CURRICULUM
David M. Moss 202

USING THE INVESTIGATING AND EVALUATING ENVIRONMENTAL ISSUES AND ACTION CURRICULUM IN A PRESERVICE TEACHER EDUCATION PROGRAM
Lucie Ngongbo 206

ENVIRONMENTAL EDUCATION: WHO SHOULD DO IT? THE ISSUE OF ACADEMIC TRAINING
James W. Parker 209

TEACHING KIDS TO LOVE THE EARTH: EARTH CARING ACTIVITIES FOR YOUTH, FAMILIES AND COMMUNITIES
Joseph F. Passineau 216

STRATEGIES FOR IMPROVING CROSS-SECTOR COMMUNICATION IN ENVIRONMENTAL EDUCATION
Kathleen Pickering and Michelle Harvey 220

ENVIRONMENTAL CITIZENSHIP AND POLITICAL CONTROVERSY: THE CHALLENGE OF BRINGING ANALYSIS OF PUBLIC POLICY ISSUES INTO ENVIRONMENTAL EDUCATION
Zygmunt Plater and Peter Shelley 224

FROM SNAILS TO ALPHA MALES: PLANTING THE SEEDS FOR A NEW ENVIRONMENTAL ETHIC
Richard Ponzio, A. Michael Marzolla, and Martin Smith 228

STRATEGIES FOR ENHANCING ENVIRONMENTAL PERCEPTION
Diane Pruneau and Jocelyn Daigle 232

GIS APPLICATIONS IN ENVIRONMENTAL EDUCATION
Monica Ramirez 236

TOUCHING THE HUMAN HEART: OURS AND THEIRS
Paul H. Risk 240

TEACHER EDUCATION: PERSPECTIVES OF ENVIRONMENTAL EDUCATION
Christine Robertson 244

PROFESSIONAL DEVELOPMENT IN EE: ACCOMMODATING DIVERSITY THROUGH DISTANCE EDUCATION
Ian Robottom and Jennifer Andrew 251

WHY SOME PEOPLE RECYCLE AND OTHERS DON'T
Arrye R. Rosser and Rosanne W. Fortner 256

ENVIRONMENTAL MANAGEMENT EDUCATION IN AN INTERNATIONAL CONTEXT
Robert E. Roth 262

FIVE YEARS OF EE LAW: A CHANGING POLITICAL CLIMATE
Paul McD. Rowland 268

THEORIES AND PRACTICES OF PRIMARY SCHOOL TEACHERS OF EVE IN QUÉBEC
Alain Roy 271

ENVIRONMENTAL EDUCATION RESEARCH
Tania Guimarães Santa Rita, Maria Cecilia F. Souza, Paula Pereira 276

ROLE OF ZOOS AS CONSERVATION CENTERS
Carol D. Saunders 278

LANGUAGE, CULTURE, AND EE: WHAT'S THE CONNECTION?
Mary J. Schleppegrell 283

MULTIDISCIPLINARY ENVIRONMENTAL SCIENCE
Donald J. Schmidt 289

URBAN CHILDREN'S PERCEPTIONS OF NATURE
Deborah Simmons 293

AN AUSTRALIAN LANDCARE APPROACH TO ENVIRONMENTAL EDUCATION
Tania Stadler 297

TANNER'S TWENTY-SEVEN
R. Thomas Tanner 301

DOES IT BITE? CAN I PET IT? EVALUATING AND IMPROVING EDUCATIONAL PROGRAMS USING LIVE ANIMALS
Pat Tucker and Bruce Weide 305

EVALUATING EE PROGRAMS: FROM PLANNING TO PROCESS
Carol Walker, Steven Bissell, Don Hollums, and Marcella Wells 310

SCHOOL-BASED DEVELOPMENT OF ENVIRONMENTAL EDUCATION IN VOCATIONAL EDUCATION
Arjen E. Wals and Art H. Ablas 314

UNIQUE PROGRAM STRATEGIES FOR YOUTH WATER EDUCATION
Kelly J. Warren 321

ESTABLISHING PRESCHOOL PROGRAMS AT EE CENTERS
Ruth A. Wilson 324

LEARNING FROM A LAKE: DEVELOPMENT AND ASSESSMENT OF "THE GREAT SALT LAKE STORY: AN INTERDISCIPLINARY ACTIVITY GUIDE"
Sandra A. Zicus 328

A FRAMEWORK FOR ENVIRONMENTAL "RISK" EDUCATION: SELECT RESULTS FROM A NEEDS ASSESSMENT
Michaela Zint and R. Ben Peyton 331

NAAEE Background 337

CONFERENCE ACKNOWLEDGEMENTS 338

WINNERS OF NAAEE AWARDS 342

NAAEE HISTORY 344

Preface

From the vantage point of a decade of attending them, I think I can say that the annual meetings of the North American Association for Environmental Education are known for their diversity, usefulness, and sheer fun. The Portland meeting was no different. This was NAAEE's biggest conference ever, with over 1,200 people attending from almost every corner of the USA and Canada, as well as from Brazil, England, Mexico, Norway, the Netherlands, Taiwan, and Australia among others.

It is a pleasure to have edited the proceedings of this meeting. The papers included here give a fine sense of the activity, contributions, and enthusiasm of the environmental educators and scientists who took part. Papers and reports from the NAAEE Sections and other special workshops are presented first, followed by contributed papers, and finally a section providing background on NAAEE.

As with every NAAEE conference, special thanks are due to the many volunteers who made it happen. Here I want to single out the conference chair, Judy Braus, and Peter Corcoran who assisted her; the program chair, Lori Mann; the special events co-chairs, Brenda Weiser and Lisa Knauf; and the local arrangements chair, Dot Lamson. Many others contributed and they are all acknowledged in the Acknowledgements section of these proceedings. Thanks to them, and thanks to all those who participated and sent papers in to me. Many organizations contributed to sponsoring the Portland meeting. They, too, are listed in the Acknowledgements section.

Finally, I am grateful to Paul Muncaster of WLU Computing Services and Marcia Ruby of *Alternatives* magazine for assistance with text file translation; to Pam Schaus for graphics scanning and translation; to Carol Allemang for assistance with correspondence, and to Anna Waldvogel for typing support.

Symposia Papers and Reports

Non-Formal Section Workshop - EE: Getting to the "Art" of It All

James N. Bull

Cuyahoga Valley National Recreation Area

It's a regular table, but it draws the participants like a magnet when they first come in the door. There's an assortment of brightly colored paper, hand-made papers with the wood fibers still visible, cardboard, beautiful gift wrapping with marine motifs, yarn in different colors, a variety of fabrics and glue. From these people launch into their first task of creating a representation of "place" that is special to them. By the end of the half hour allotted for this activity, participants are still engrossed in this project. One by one the projects are affixed to the wall where we can all view them for the remainder of our time together. Instead of name tags, these personal place posters will be an entree to learning about each other informally.

Are the arts an important ingredient in Environmental Education? We've all expressed some interest in integrating the arts in our work by our very presence here. Why do we want to do art in Environmental Education? The discussion in small groups begins and takes off to new heights. Now comes the challenge. Encapsulate and communicate the group's thoughts not through an oral report back, but through artistic expression. One group was asked to create a poem or poems to convey their message. Another group was asked to draw with crayons, while the remaining group created sculptures with salt-dough clay to answer the same question. Then the whole group toured these creations. The creators stood back while the members of the other two groups spoke for the meaning they perceived in these works of art. We learned that there can be more to our creations than we can see through the lens of our perspectives. Although we create art pieces, they speak to each person who views them in a different way. We all agreed that we had become aware of things in others' art and in looking at our own art through the art of others that we had never realized before.

We had immersed ourselves in not just talking about art but really doing it. With this introduction, it was time to walk across the street to the Portland Museum of Art. Education Director, Dana Baldwin started us on the top floor with its port hole view of the bay and Holiday Inn and took us down not only through the museum's fine collection but helped us experience the building as a work of art as well. Could an art museum have potential for an environmental education experience? There are more possibilities than we could have imagined. Art reveals different perspectives and attitudes toward the land and how we react to art often reveals our own. What kind of environments do we prefer in paintings and sculpture? How does that compare to where we actually live? How does the artist seem to feel about the environment? How is the city treated vs. the countryside? The environment seemed to be a strong theme even in many works where people were the focus. What materials used tell a story in themselves. Are there cultural differences expressed through the arts? We learned that education in art museums is fun, discovery and investigation-oriented these days.

One exhibit we viewed, a collection of art that chronicles the history of Portland through paintings was suggested by elementary and middle school teachers--a first for this museum and maybe for museums generally. The special exhibitions on the "Allure of the Maine Coast," and "Artists of Monhegan Island," capped off our indoor visit nicely. Clearly artists were inspired by Maine's rugged beauty and helped spur interest in its preservation. But enough of being indoors--the sun was out and it was a beautiful day.

In the side yard of the museum, we gathered on the lawn. Before us were piles of kelp and other seaweed, shells, an assortment of fall weeds, pieces of driftwood and other materials from an ocean beach. Our task: as a whole group create a Mandala on the ground. With few if any words, the Mandala starts to take form. Several take hands of seaweed and together create a large circle. Another adds splays of grass to the center. An outer ring is formed. Shells and weeds find their places. There is an opening to the circle on one side. Without any explicit planning several realize we had unwittingly oriented the opening toward the East and the rising sun. Coincidence? We finally use every item and stand back to admire our work. The Mandala would stay on in its place for at least the next two days. Nice of the art museum to let us create a piece on their lawn.

Before dinner we reflected on what we had learned and applied some theory and research to our experiences and in preparation for those to come. After dinner we heard each other's interpretations of our "personal place posters," and then gave our own. After a brief introduction to this place by Deb Garrett of the Maine Department of Environment we were ready for the entrance of Mr. and Mrs. Fish, alias Deb and Jeff Sandler. Through zany skits, and outlandish colorful costumes Mr. and Mrs. Fish delighted us with a marine detective story, teaching us not only about the sea but about the effectiveness of drama an education tools as well. These two fish people hail from South Portland but are in demand all over the world. We were lucky to hook them for this workshop (yes the pun was intended and this couple would definitely appreciate it because their skits were full of them). The evening closed with a moving story from Carol Soth about how the constellations came to be. Stories are probably the oldest art form and still have such power to move us today. Carol demonstrated that effectively.

Wiping the sleep from our eyes at seven o'clock Saturday morning participants clambered into a van and leaders into a car headed up to the Freeport area (or do we say 'down" in Maine?), to Wolfe's Neck, a peninsula situated between Casco Bay and the Haraseeket River, where we would be spending the day. Our first stop, Wolfe's Neck Woods State Park. There we were met by naturalist Pat Bailey who was so in tune with the arts theme that she started our brief sojourn with a food web symphony, conducting a suite for four seasons! What fun! Later we split into two groups to become colliding continental plates and took roles of food web members who all contributed DDT and other biomagnified pesticides to the osprey. We arrived at the shore and just drank in its beauty which would inspire our artistic endeavors for the rest of day.

Just a short drive further down Wolfe's Neck we came to our destination for the rest of the day: the University of Southern Maine's Stone House. A mansion of stones, with tall white pillars, tiffany windows and wonderful views of the bay and the river from the high bluff from which it is perched. But the day was so perfect we spent most of our time outside on the beautiful grounds which include native forest, a heath garden, a rhododendron garden in progress and a stone-walled European garden.

Here Bill Hammond passed out paints, brushes, markers, colored pencils, film canisters for water and lots more, all for us to begin our "creative journals," changing the media every few pages to change our thinking. Most participants said they were motivated to keep a journal when they learned it could be such fun and that ideas could be harvested from it pages that would be useful in their work. Each journal cover was as distinctively designed as each participant--wonders to behold. The hour and a half went by swiftly. It was time to move on... literally.

Mary Ellen Schaper, a physical education and dance teacher in the Portland schools, was waiting for us at a picnic table near the heath garden with a panoramic view of Casco Bay behind her. She had set up a miniature stereo system and had tapes spread all around the table. To ease us into movement and dance, she had us simply move around trying different things but not touching more than three limbs to the ground at a time. She asked us to remember our sequence of moves and then played music for us to move to. In small groups we flowed into a dance activity that dealt with symbiosis–the dependence of one organism on another. We also learned the concept of negative space, moving in-between, around and on top of the other people in the group wherever we could find an interesting space. Groups then recreated their pieces to music for the other to see. Through dance each group interpreted some aspect of Spring–from a mushroom with a T-shirt cap to a fountain that actually sprayed water as a finale (these dancers danced the first part of their dance with full mouths of water). Finally we were given maps from different cities or areas of the country with an outlined routes. We recreated the route and danced an interpretation of some the sights we saw along the way all to music. Mary Ellen has a wonderful music selection to go with her wonderful teaching style. When time came for lunch, we still wanted to move. Each session seemed to leave us wanting more.

Lunch was served in an elegant dining room overlooking a cow pasture of U of Southern Maine's organic beef farm, and the Haraseeket River beyond. A sumptuous and filling lunch. We gathered in the walled garden afterwards and listened attentively to Michael Shaughnessy, chair of the Art Department at the University of Southern Maine, speak to us about the nature of art, the importance of becoming close observers of nature in all its colors and textures. We were then sent out to really experience the colors and textures of nature, to just observe for a while and then if felt moved to re-arrange some things we found to create simple sculptures that would stay in place and recycle themselves. The process is what was important. We were given one tool as a product of our eons of evolution that we might use if we desired–a single-edge razor blade. This was a needed individual and reflective time after lunch. Wonderful creations sprang up all over. In our discussion of the activity some expressed reluctance they had felt at altering anything, but then doing it even though feeling a little anxious. Are we reluctant to see ourselves as part of nature's performance? Why? Can our creative expression be a way of saying thank you? Shaughnessy indicated that unlike Science, art has a way of taking us into a spiritual realm. Both are important.

Mr. and Mrs. Fish capped the day with a workshop showing us a little more in depth what they do and involving the audience in a couple of their productions, reaffirming that drama can make education come alive. Before leaving participants had a chance to reflect through art one thing that they didn't know or one thing that they would take with them from the workshop. We shared these in a circle, gathered up our things and got on the bus, heads happily swimming with new ideas and our bodies, minds and souls re-invigorated. I know I'm glad I came.

(Some of the creations from the workshop were displayed. Photographs and a video tape document workshop highlights.)

Responses of Participants to "EE: Getting to the Art of It All":
I Didn't Know That...

I didn't know what a wonderful tool art can be. Creative, Thought, Action, Place. I didn't know where art and nature merge. Dancing leaves, musical breezes, patterns, color, light, dark. I didn't know how deeply my need for art and nature together is.

I didn't know that negative space could be a three dimensional term. Bodies intertwined in celebration and didn't know that journals could be so alive. Expression should never be limited to words alone.

I didn't know about the environment or how I fit in. I didn't know about the environment or where I should begin. I didn't know about the environment or how to make it better. I didn't know about the environment but I learned we're all in it together.

Movement in nature, in me, aliveness, learning everything, anything is possible.

I didn't know: I still dream of dancing, words can fly across the soul, enough is never all I wanted. Art is part to make the whole.

Didn't know people who didn't know each other would so easily share through clay, poetry, dance, creating together. Didn't know how much I missed the diversity of hardwood trees--their bark, texture, leaf shapes and colors and smell.

It's not that I didn't know. It's that I didn't take the time to... listen to the breeze, feel the warmth of the sun, be alone, reflex, celebrate.

I didn't know who makes the holes in clam shells. Art is taught through creative performance. Puppets. I didn't know about the lure of painters to Monhegan Island. I didn't know that others would articulate word and sign pieces to my mission's near home.

Philosophy of Putting the Arts in Environmental Education

James N. Bull
Cuyahoga Valley National Recreation Area

Developed for the "EE: Getting the Art of It All Workshop"

For two days about twenty workshop participants and leaders in the "EE: Getting to the Art of It All," workshop explored the arts, experienced the arts and discussed the importance of the arts to environmental education. We discussed and experienced three ways of incorporating the arts in environmental education:

1. Appreciation (Taking in the artistic expression)

One of the easiest and best things we can do is just appreciate nature for the beautiful work of art it is and realize people are inspired to create paintings, pieces of music, sculpture, drama, dances and more in response to nature's splendor. We can deepen our own appreciation of nature and gain new perspectives by viewing and appreciating art created by others. We explored this appreciation mode in our visit to the Portland Museum of Art and through observing a performance by Mr. and Mrs. Fish, two educators who teach about the marine environment through creative drama.

2. Creation (Expression for Self)

Nature is always creating and as part of nature we were created as *Homo creativa* ourselves. We love to create and we learn and love through our creations. Conventional education usually does not tap or nurture our creative powers very much. Creating for the sake of creating, for the process itself is so important. Michael Shaughnessy purposefully had us make sculptures that would stay in place and biodegrade so we would get in touch with the process of art itself, as opposed to the product. Creating as part of environmental education is important because we learn so much through creating that we can learn no other way. In the process we discover not only our environment but ourselves as part of it. As M.C. Richards once said, "The most important thing a potter makes is the potter."

3. Performing or Presentation (Expression to others)

Of course nature's performance is constant and always public for those who take the time to listen and watch. As we create we may discover ourselves as part of nature's performance, one player in a magnificent symphony of life, as Pat Bailey demonstrated with her musical food web. As we get more in tune with nature's performances we may mimic nature's performance and through trial and error produce something original, but still grounded in nature.

We can create just for the sake of creating, just for ourselves, but when we decide to share our creations or perform them a whole new dimension opens up. We can communicate our deepest feelings, hopes and desires through the arts. The arts are a universal language that helps us communicate things that may be impossible to communicate through words alone.

But why should we get involved with the arts in environmental education in the first place? There are at least seven reasons:

1. Art Aids Understanding

If information is not presented to us in some kind of structured way we find it difficult to construct meaningful cognitive maps. Stories are a time-tested way to teach because they are structured for easy understanding. They have recognizable parts, follow a progression and can imbed powerful concepts and truths. Stories may be the earliest form of art and certainly a very early form of teaching that is still unrivaled today. Good stories engage our attention and we remember them because of their structure. Similarly we are able to assimilate information much better if we can see a picture that helps explain the concept. There is much truth to the old adage that "a picture is worth a thousand words."

It is clear from the research that while concreteness and structure are important to all of us, they are even more critical for at risk kids. If we are to reach the great diversity of people in this society, art can help us tremendously.

Art reaches us at a deeper level than mere facts and figures and thus adds to the depth of understanding. Through art we enter the realm of the affect, **or** heart, **or** feeling, or as some artists like Michael Shaughnessy who are deeply honest have talked about art reaching us in our souls or in the spiritual dimension. We may remember facts but art has a power to move us. Research has told us for years that knowledge is not sufficient for Environmental Education to be effective. The Affective key has long been identified as a key to behavior change through environmental education. Art taps the affective realm powerfully. In art we are able to experience deep connections to the environment that are part and parcel of Deep Ecology. Art is truly a potent way to know oneself and the environment.

2. Art Provokes an Emotional Response.

Art is a personal thing, when you take what you've learned and create something new with it, you not only learn it well, it becomes yours. Through artistic expression, passion for the self and passion for the environment can happen. Experiences in nature inspire us, even when it may be the experience of degraded environment. When we are inspired, we are compelled to create and through that creation we transform ourselves and the environment. I'll never forget meeting a young woman who had been part of a water monitoring project in which we also encouraged the classes to create tapestries to represent their sites. She asked me if we still had the tapestry her group worked on. Unfortunately the arts groups we worked with had discarded it. She was crushed but talked eloquently about how they had worked many extra hours at her house and how much it meant to them. That tapestry had become an extension of themselves. It was the most powerful part of that whole project for her.

Students in arts integrated curricula have been demonstrated to learn more than those in a conventional curriculum. Some of that can be attributed to structure and hands-on nature experiences, but a big piece of it is motivation. At risk students learn better through the arts than more passive classroom activities and thus are more enthusiastic about education when it is imbued with the arts. In art everybody can experience success. Anybody who has watched young people with crayons and pencils can testify that they are happier when they are involved in art projects. Art makes learning come alive and makes learning fun. Dropout rate and absences decline when art is integrated into the curriculum.

3. Action

It has long been an axiom of environmental education that effective programs should empower participants to take action, but it is less clear what "action" actually is. Usually we think about planting trees, picking up litter or lobbying for a particular political outcome. Can we enlarge our definition of action to include artistic expression. What could be more potent than an artistic creation shared with the world, for as was pointed out earlier, through art we reach the heart. People are more moved by artistic expressions and persuaded to take action themselves through art than by facts and elocution. Because art is a universal language artistic action can reach more people and transcend more barriers than many other kinds of action. Most great social movements have been propelled, undergirded, nurtured and extended through the arts. Music is especially potent, but guerrilla theater, dance, paintings and sculpture have made their mark as well. Central United Methodist Church in downtown Detroit, well known for its peace and justice work, was not able to reach many other congregations with its message until it decided to open the Swords Into Plowshares Center, an art gallery devoted to "Transforming Visions of Peace". Churches from all around bring groups to view the exhibits and to participate in the center's programs. According to center director, Rev. Dr. James Bristah, dialogue with people in these churches has begun that just wasn't possible before the art gallery enabled these people to come together.

4. Wholistic Skills

Artistic endeavors whether they be painting, dance, drama, music or sculpture require knowledge and thinking but also involve kinesthetic and affective learning. It may be easier to integrate the cognitive, kinesthetic and affective modes of learning when art is involved, because all are so essential to the creative process. When a student or group of students set out to create a piece of art, they learn problem solving skills that transfer to other arenas of the curriculum. Learning to solve one problems doesn't always help in solving another, but perhaps because art integrates the three modes of learning and requires imagination, problem solving skills developed through art do seem to transfer better. For instance students who participated in an arts integrated curriculum improved their reading and math abilities as well.

When art pieces are the result of group efforts, students must develop team work skills in order to successfully complete the project. There is also a sense of accomplishment that can bring the group closer together. Emotional bonds are forged in the process of creating something together and strong group ownership.

5. Multicultural Connections

Art is the most potent way we express our culture. Through art we can express our own culture and learn to appreciate and understand other cultures. Music, dance and visual art make culture come alive. As we observe art from other cultures or experience dancing or singing in new ways, we experience the richness and joy that comes with our cultural diversity. Every culture answers at least two important questions for us: how do we relate to each other and how do we relate our environment? Since art is a cultural expression, art helps us understand our relationship and that of other cultures to the environment. Often the art of a culture depicts or mimics salient aspects of the environment in which the culture developed. Since art materials come from the earth and much art is inspired by nature, through art we come to know existentially that we are part of nature and her creative energy.

5. Creativity.

What we need more than ever to solve our complex environmental problems is creativity. And what calls forth our creativity better than the arts. Bill Hammond asserts that whenever we use a different medium to express ourselves, we think differently. What power there is in being able to think differently. If we think differently, we may find solutions to problems that we never imagined. We may also act differently. In too much of traditional disciplinary education there are a series of right and wrong answers. Thankfully in art, when it is taught well there are no wrong answers–divergent thinking is encouraged. What could be more hopeful?

6. Vision Thing

Through the arts and though experiencing art of others we can revision reality, conceptualizing a better future which is radically different from present reality. By calling forth our creativity, through art we can be playful and construct a endless alternatives, some of them wild and crazy. It is those ideas that at first seemed crazy that in the end may be the most helpful. Vision is the first important step in getting to another spot. While "doom and gloom" scenarios can be debilitating, striving toward a dream is an adventure which is intrinsically motivating.

Harvey Cox wrote a wonderful book in the 1970"s entitled *The Feast of Fools*. It took its title from a medieval festival in which for a few days the whole world was turned topsy-turvy. There was a mock-King, a lord of misrule and even a mock-Pope who ruled the day and poked fun at the established order. Serfs became masters and masters became the serfs. Celebration, which always is artistic and creative, took people out of their day-to-day lives, and for a moment they entered a different realm of time. Call it eternity or fantasy. It gave them hope because they could imagine a different world, which started them thinking. If it could be like this for a few days, why not all the time. For those in power, this festival was too dangerous to tolerate for long so it was crushed. What is one of the first things any dictator does upon coming to power? Crush the arts and artists because they can be a subversive influence. If such powerful people are afraid of the arts, there must be something powerful there worth cultivating!

Global Briefings Symposium: Commentary on the Papers

John H. Perkins
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This symposium, "Global Briefings: Patterns of a Changing World," featured three excellent speakers, one each from Canada, Mexico, and the United States. In very different ways, each participant developed an important theme: J.W.B. Stewart explored the workings of some of the most important scientific panels on the nature of global change and on ways in which Canada was promoting research on the implications of global change for Canada. Tiahoga Ruge Scheffer delved into the ways in which media and mass communications can promote greater environmental awareness on the part of citizens. Francisco Dallmeier explained the workings of the Man and Biosphere's Biological Diversity Program and how environmental education can make better use of research on biodiversity.

Together, these three papers emphasized that the problems faced by environmental educators are global in nature, require an effort to reach all citizens, and will affect all species on earth, including our own. I won't attempt to summarize each of their findings but refer the interested reader to their papers, which follow. My commentary instead will suggest three issues that these papers raised.

First, we must take note of an important trend that has occurred in the last twenty years of environmental education: increasing specialization and a consequent danger of losing sight of the "big picture." At one time, environmental educators had the main task of conveying the message that the environment could not be taken for granted. Environmental education had to establish the case that the environment mattered and that human activities had the potential to destroy it as habitat for many species, including ourselves.

Over the past twenty years, environmental education has been strikingly successful in establishing the case that the biosphere cannot be taken for granted. As that message became part of the common wisdom, especially in developed countries, environmental educators began to specialize. Some did just K-12 work. Others turned to the various non-formal audiences. Faculty and students in higher education began to create more specialized programs, e.g. in conservation biology, hydrogeology, risk assessment, geographic information systems, and so forth.

All of these efforts at specialization made it possible to develop better teaching programs for unique audiences. Thus they added strength to the ability of environmental education to play a role in the larger political and economic spheres of society. Unfortunately, the specialization carried a down-side to it: specialists can lose track of links between different environmental problems. I think this Symposium's three papers do a wonderful job of reminding us that the big picture is important and that an integrated message needs to be taken to as wide an audience as possible. Media participation, as Ruge notes, is essential to reaching a wide audience, and her work in Mexico, Canada, and the United States is to be applauded.

The second point I would suggest is that these papers, particularly the ones by Stewart and Dallmeier, remind us of the very real tension that currently surrounds efforts in environmental protection. At the moment, especially in the United States, we have some people who have a concern about the environment that leads them to regulation and curtailment of existing economic activities. In tension with them are other people who operate in a climate of disbelief that environmental problems are real or large. These people are led to dismantle regulatory structures and turn management of natural resources over to market forces. At the moment, the latter forces control the United States Congress and are in the midst of the largest rewrite of environmental policy in twenty-five years.

This commentary is not the place to explore this tension or to reach judgments about which side is right, although I will freely admit to being one of those who has a deep concern about the human potential to make the earth unlivable. Instead, it is important to note that the tension between those who do and do not believe in the seriousness of environmental problems often focuses on a conflict over land and the regulation of its use. Those who believe we can destroy the environment raise the cry for regulation to curb destructive behavior. Those who think the problems aren't so serious raise the cry that private property has been taken illegally and that society's wealth and well-being has been diminished by unnecessary rules.

Stewart's paper explains the very sensible steps Canada has taken to explore the implications for Canadians of global change. Dallmeier's paper explains the careful steps sponsored by the Man and Biosphere program to document and better understand biodiversity and how to preserve it. I suspect their careful work will not by themselves convince those who want no social or legal restrictions on land use. Nevertheless, both of these papers outline exactly the sorts of research and education efforts needed to resolve the tension between the environmental believers and non-believers. Ruge's paper reminds us that the sorts of work advocated by Stewart and Dallmeier need to be translated into messages suitable for the mass media so that the citizenry as a whole can participate in some of the most momentous decisions facing human beings in the next century.

My final suggestion for appreciating these three papers is to note that each of them relies upon an assumption that a "sustainable society" is to be preferred to its opposite. While I have no quarrel with the value attributed to sustainability, I suggest that, as always, we need to explore the exact meaning of the term. My colleague Tom Womeldorff has taught me at least four fundamental questions that need to be raised whenever sustainability and its virtues appear on the scene:

1. What is to be sustained?
2. Over what area?
3. Over what time period?
4. By whom at whose expense?

The three papers in this Symposium do not delve into the sort of discussion that these three questions invite. I do not fault the papers for this lack, but I think it is important never to lose track of them. Perhaps the most fundamental challenge faced by environmental educators is the task of making "sustainability" meaningful for the general citizen. This means that the concept has to be translated into forms that are transmittable by the mass media, especially television. Stewart and Dallmeier have given us excellent substantive pieces to translate, and Ruge has indicated the importance of efforts to bring the mass media into the arena of environmental education.

Acknowledgements

At this point I want to thank each of the panelists for their excellent presentation. I also want to thank Pam Puntenney and Vern Howe, who organized this session. Thanks are also due to the NAAEE International Commission and the Environmental Studies Section for sponsoring this program.

Linking the Global Network of Long-Term Biodiversity Monitoring with Research and Training

Francisco Dallmeier

Director, SI/MAB Biodiversity Program, Smithsonian Institution

In late 1985, the Smithsonian Institution initiated negotiations with the UNESCO Man and the Biosphere Program (MAB). The purpose was to create a model for monitoring forest biodiversity in biosphere reserves. After several meetings, both organizations agreed to launch a new program on biodiversity called SI/MAB.

The staff set to work immediately, making expeditions to research sites and conducting field workshops. The objective was to test the then-current methodologies in biodiversity surveys, inventories, and monitoring. Today, as the program approaches its tenth anniversary, it is clear SI/MAB has grown beyond expectations. The success is due in large part to the thousands of hours of field and laboratory work put in by staff and SI/MAB partners around the world.

The basic mission is to produce detailed descriptions of the world's forest ecosystems. That information is essential in advancing the science of conservation biology and stemming the loss of global biodiversity. After all, we cannot know what we are losing if we do not know it exists. This task employs a two-pronged approach: research and training. Research focuses on documenting floristic composition, structure, and dynamics within an international network of monitoring plots. Researchers at the plots employ consistent methodologies to produce comparable data that can be exchanged among plots and shared with other interested parties. The site-based forest vegetation information is complemented with multiple layers of other biotic as well as abiotic data. The international training and education component reinforces the site-based capabilities of host countries to ensure that biodiversity measuring and monitoring can be done locally.

BioMon, SI/MAB's computerized, user-friendly, data-management system, facilitates analysis of huge amounts of data from the field and laboratory and compilation of results into various publications for timely distribution. The program operates in 14 countries and 22 research sites, primarily biosphere reserves, and has conducted 37 professional training courses in which more than 700 people from 30 countries have participated. SI/MAB plans to expand its monitoring network to 300 plots by the year 2000, assist in developing worldwide biological data-management networks, and provide regular training for host-country individuals.

As examples, at Kejimkujik National Park in Nova Scotia, Canada, monitoring the effects of acid precipitation is considered of utmost importance. Regeneration of temperate forest is also being monitored there. At the Conservation and Research Center in Front Royal, local concerns include defoliation of trees by the gypsy moth and overgrazing by deer. Restoration after mining operations is a top priority of monitoring teams in the Kwakwani region of Guyana. In the Manaus area of Brazil, forest fragmentation ranks high on the research/monitoring list. In southern Zambia, the effects of management on savannah forest are being monitored.

In these days of tight budgets, such goals may seem particularly ambitious. But the loss of biodiversity remains a pressing problem. Nations must renew their commitment to providing timely, reliable information about forest resources and ecosystems to further the cause of conservation biology. At SI/MAB, the plan is to do just that.

Process and Strategies for Environmental Communication in North America

Tiahoga Ruge

Director, North American Center for Environmental Information and Communication

Formation of CICEANA

In June 1992, thousands of people gathered in Rio de Janeiro, Brazil to find the ways to solve the most important problem of our time: THE PLANET'S ENVIRONMENT! It was a historical moment, and for those of us that work in environment it left a feeling that all our efforts of the last years were finally bringing about the desired results! We all returned to our countries with an inspiring feeling, that now we really were going to work together as a society to overcome the environmental challenges!

Since 1992 in Mexico we have seen a rapid change of attitude towards the environment. There are two reasons for this: one is the fact that the Mexican government has taken a regional leadership in environmental issues and has for the first time a special Ministry assigned to environmental matters; second is the fact that Mexico, by signing the North American Free Trade Agreement or NAFTA, also signed the Side Agreements on Environment and Labor, between Canada, U.S.A. and Mexico. Since this agreement was signed, several processes were triggered, among them the establishment of the North American Commission for Environmental Cooperation known as the CEC, which has its headquarters in Montreal. As one of the projects of the CEC, the North American Center of Environmental Communication and Information (CICEANA) was created in Mexico City in January 1995.

The CEC is comprised of a Council of Ministers, a Secretariat and a Joint Public Advisory Committee with members from the three countries. Its mandate is to:

1. Facilitate cooperation to solve environmental issues of mutual concern.
2. Avoid potential environmental and trade disputes.
3. Ensure that NAFTA countries enforce their environmental laws.
4. Improve public access to environmental information and encourage participation in environmental decision making in each NAFTA country.

What are CICEANA's Objectives?

CICEANA's mission is to involve the greater public in improved environmental protection by working with the mass media of Mexico, Canada and the United States to create greater awareness that will lead towards a Sustainable Development. CICEANA's activities include the participation of the mass media, government, nongovernmental organizations, international organizations, private enterprise, educational institutions and others.

CICEANA is governed by a Trinational Board that plans and supervises the activities and ensures a trinational approach to the broad dissemination of constructive environmental messages and accurate environmental information.

CICEANA's specific objectives are:

- To coordinate a trilateral mass media initiative to encourage the production and broadcast of innovative, positive and constructive environmental programs in all three countries.

- To act as a public environmental information and communication center in Mexico, providing important regional environmental data and information.
- To function as a link between the mass media and specialized institutions in the three countries on environmental issues.

In February 1995, CICEANA held the First Trinational Media Meeting on Environmental Cooperation in Mexico City. As a result of this meeting, a Mission Statement was created and a work plan was developed to promote, produce and broadcast environmental programs for radio and television in Canada, United States and Mexico. It will work to assure the participation of the mass media on environmental issues and to promote the production of trinational programs. For example, CICEANA will produce the first annual Trilateral Television Program, "ECO '95," about the North American environment, to be transmitted simultaneously in all three countries. CICEANA will also establish an environmental information system for the media and public of the NAFTA countries.

In order to achieve financial autonomy, CICEANA has created the North American Fund for Environmental Cooperation to raise funds from enterprise, private organizations, foundations, mass media and individual donors in the three NAFTA countries. This is a trinational, nonprofit Fund to encourage the production and broadcasting of environmental programs that will contribute to the public awareness of North America as an ecosystem and lead to a greater environmental protection in the region.

The Current Situation in Mexico for CICEANA

Radio

In Mexico we have several radio stations that have special programmes that deal with environmental questions.

We find that the radio stations are open to environmental information, but that it is really the effort of a few concerned individuals who have been working for years and are now getting a little more exposure than they had before.

Printed Media

As far as the Printed Media is concerned we find a similar situation. There are excellent articles on the environment that have a certain periodicity, but again written by concerned individuals that had been doing this work before. News stories on environmental issues are reported, but these are covered in the same fashion as any other news being covered. Environment is a great subject for the news, but sometimes it seems as if reporters love to show the degradation of the planet, until one day we will hear the last news: "Well, this is the latest news on how planet Earth had its last breath of fresh air!" In short, the news media are acting as informers but need more preparation to act as a means to create awareness and education!

Television

As far as television is concerned we could say that initially ENVIRONMENT was certainly not a priority, and there hardly existed a real opening for environmental programs. This was really a matter of concern, considering that television in Mexico is probably the most influential media and that the environmental problems we face as a country are also really a matter of alarm.

Let us look at some interesting numbers that refer to the television exposure in Mexico: (These figures were given by GRUPO GAMMA, IBOPE, Mexico.) In Mexico City the exposure to TV is as high as 97.7%. In other cities exposure is similar, with the following numbers: Guadalajara: 98%; Monterey: 98.1%; Jalapa: 99.7%; Puebla: 99.8%; Tijuana: 94%. The average daily exposure to television is between 3 to 4 hours a day, depending on the age group. And what are the most watched programs? Well, soap operas. To give you an idea, a very popular soap opera, with a daily transmission of 21 hours, was watched, just in the Mexico City area, by five and a half million people. This means about half of the population!

We concluded that we would not achieve environmental awareness if the media, especially television, did not develop an environmental policy and assure a constant participation! So, the question was: How do we use the successful experience of television to raise environmental consciousness and action?

Here we started to develop the following strategies:

- Production of interesting programs, including soap operas, that have an environmental content and that are interesting and exciting.
- Find the appropriate way to communicate on environmental issues that have the following points:
    1. Current information on the theme.
    2. Explanation of the problem and possible solutions that are in the reach of people.
    3. Offer the possibility of more information.
- Capture the interest and participation of the Media to create an environmental communication that is effective, integral and constant!
- Apply the commercial Model of Television to Environmental programs. This means to get the sponsors interested to pay for the transmission of environmental issues, which would assure the transmission on prime time!

We already have some results: for example, LA CADENA DE LAS AMERICAS, sponsored by Televisa during six months in 1992 with a main objective to unite sixteen Spanish-speaking countries through programs of common interest, such as history, literature and environment! Other successful programs on environment and communication include LA VIDEOTECA DINAMICA DE ECOLOGIA Y DESARROLLO, which is a joint program of SEDESOL and Amigos de la Biosfera A.C. and which has a goal to achieve a nationwide project on Environmental Communication and Education.

The Future of CICEANA

In order to be successful with CICEANA, we will have to find the points of common interest that unite the three countries in the environment, communication and information to the public. The First Trinational Media and Environmental Cooperation Meeting was organized through the CEC and CICEANA in February 1995 to explore the interest and participation of the Media. Initially we were not quite sure how the reaction would be, and to our surprise we received a very enthusiastic response from the Media executives from the three countries.

Mexico now has a special Ministry dedicated to environmental issues: SEMARNAP - Secretaria de Medio Ambiente, Recursos Naturales y Pesca - Ministry for Environment, Natural Resources and Fisheries.

Issues that just a few years ago would have been taken for granted are now causing environmental concern and awareness and are becoming nationwide issues that are actually discussed in the Media.

But we still have a long way to go. At the present moment we can see an enhanced awareness of environmental issues, but not yet a full understanding of the issues and what to do about them.

Since there are no special recipes on how to solve environmental problems, and since the solutions to these are a combination of social, political and environmental subjects, it seems that in order to find the way, a collective process of "environmental education" is on its way. In order for this to continue, we need to enhance our efforts to inform about environmental issues and find the right strategies of communication in which individuals will grow into a society with an Environmental Culture.

Environmental Issues and Education: A Canadian Perspective

J. W. B. Stewart

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Introduction

It would be naive to assume that concern with the environment started with the Stockholm United Nations Conference in 1972 and the formation shortly thereafter of the United Nations Environment Program. However, these events focused an immense amount of attention on environmental problems and an ecological approach to same. Before that date there had been several important programs that had been very useful, particularly in the life sciences in the development of interdisciplinary research and thought. An example would be the International Biological Program (1968-73) which allowed many biologists, agronomists and recreational land users to work together on specific sites. As the program developed, confidence grew in the value of a systems approach to this interdisciplinary study. Further simulation models were developed which could be used to verify hypotheses and had the capacity to be used in a predictive manner. The success of this interdisciplinarity led to a second program, Man and the Biosphere, which was much more complex as it dealt with humans in the environment and therefore the need to bring other disciplines such as economics, sociology and the humanities into an interdisciplinary approach to understanding environmental consequences.

In 1969 the International Council of Scientific Unions established the Scientific Committee on Problems of the Environment (SCOPE). SCOPE has concentrated on scientific issues that have major significance on the world environmental scene, and has been at the forefront of synthesis and discussion on selected problems for over 20 years. Because it is genuinely international, nongovernmental, and interdisciplinary, it has been successful in bringing together leading scientists to debate, synthesize and give direction to research and environmental problems of global concern. It further has provided timely and pertinent direction to research centers, agencies and government and environmental issues. As an outcome of this it has had a tremendous effect on the research and curriculum being developed at universities to study environmental and ecological issues.

SCOPE reports were published and made available through John Wiley & Sons commercial publishers. Of particular interest is SCOPE Report no. 29, edited by B. Bolin, et al., in 1989, which focused attention on the accumulation of gases in the atmosphere such as CO_2 and CH_4, the so-called greenhouse gases. Shortly thereafter ICSU decided to set up another special committee, the International Geosphere and Biosphere Program (IGBP) to study global change. This is by far the most ambitious research program ever to have been launched on environmental issues. The IGBP committee, in attempting to examine all aspects of global change, whether greenhouse gases, population growth, sustainability, etc., took a decision that the IGBP would concentrate on the scientific interaction among the life sciences and would not directly research human interactions. That interaction was left to a second international program, the Human Dimensions Program, which would relate an understanding of life science processes to socio-economic, and humanitarian effects. This decision was hotly debated at the time as it was clearly absurd to study the effect of humans on the environment without examining the reasons for employing forcing functions that would make this happen.

Despite these reservations, it was decided that initially the IGBP should concentrate on the physical and life sciences. Thus the IGBP published a research strategy in 1990 which developed a set of linked projects to examine those environmental systems and processes, and in the same year a consortium of the United Nations United University, the International Social Science Council and the International Federation of Institutes of Advanced Studies announced the International Human Dimensions of Global Change Program, with a mandate to carry out research necessary for understanding global change under the following topics: land cover/land use change; social dimensions of resource use; perception and assessment of global environmental conditions and changes; impacts of local, national and international social, economic and political structures and institutions; energy, production and consumption; industrial growth; environmental security and sustainable development.

Other International initiatives of importance in global change include the World Climate Research Program (WCRP) which addresses both anthropogenic climate change as well as climate variations. Finally governments required their own assessments and UNEP and the World Meteorological Organization (WMO) established the Intergovernmental Panel on Climate Change (IPCC) in 1988 to assess the state of knowledge about climate change and the environmental and socio-economic impacts of climate change. IPCC formulates response strategies and provides advice and counsel to governments through UNEP and WMO.

The Canadian Global Change Program

As many Canadians have been involved in aspects of all SCOPE, IGBP, WCRP, WMO and human dimension programs, the Royal Society of Canada in December, 1985, established the Canadian Global Change Program to stimulate and coordinate Canadian research into global environmental change with that of these international initiatives, and to communicate the results and ideas from that research to the national and international research and policy development community. Global change research activity in Canada is spread amongst the diverse range of individuals and institutes representing equally diverse disciplines. The function of the CGCP therefore is to act as an umbrella program for coordinating and sustaining that research in the big picture and providing the required policy support at both national and international levels. The Royal Society of Canada's decision to include the natural sciences, social sciences and humanities all within the mandate of the CGCP has received praise internationally for taking such a visionary approach. The CGCP remains one of the few global change programs which encompasses both the human dimension and natural sciences.

Nevertheless the CGCP took some time to formulate its program, initially through its research committee, which is composed of scientists, private sector and special interest group representatives and senior government officials with research and policy concerns. The committee acted through the production of a number of research panel and project committee reports and by developing and periodically reviewing thematic research priorities for the CGCP. These activities generated reports addressing topical scientific and public policy issues and fostered interdisciplinary and multi-agency research projects that will improve Canada's capacity to respond to global change and provides a strong link between Canadian research and international activities. In October, 1992, the CGCP Research Committee identified a new list of global change themes to provide direction for Canadian Global Change research over the next decade. These themes were chosen to represent that information most needed by Canadian governments and policy makers to form effective and relevant decisions on global change issues (cf. D. McLeod 1993).

Canadian Research Priorities for Global Change

The CGCP Research Committee identified 22 research themes as priority for significant research to understand global change. These were chosen based on information required for Canadian governments, institutions and communities to form effective and useful responses in policy and action on environmental change. The themes fall into three major areas – biophysical consequences and human or socioeconomic impacts. Forcing functions or driving forces are those themes which are the underlying and approximate causes of global change. Biophysical consequences include the actual and tangible results of those causes in the natural environment. Human impacts are the effect of global environmental change on human socioeconomic systems including how these systems adapt to global change. The three areas also roughly represent three important components of global change research – causes, results and adaptation or mitigation.

The forcing functions or driving forces are the underlying approximate causes forcing global anthropogenic environmental change. Five forcing function themes were identified by the research committee as priorities for research in approximately decreasing order of priority:

1. culture and values,
2. energy and resources consumption,
3. population growth and distribution,
4. global economics, and
5. natural processes.

Of these the term "natural processes" requires some clarification. It refers to those processes and global systems which drive the earth's dynamic balance such as atmosphere, the ocean, all the various ecosystems, plants and animals and the earth's geological processes, e.g. volcanic eruptions. These systems or processes are thought of as being natural because their activities would carry on without human intervention.

Biophysical consequences represent the tangible and observable environmental manifestations of global change propelled by forcing functions. The results are largely anthropogenic but it is important that change has existed since the planet first formed. The CGCP Research Committee identified eight biophysical consequences as follows:

1. ozone depletion,
2. climate change,
3. air/water pollution,
4. forest impacts,
5. food resource impacts,
6. biogeographical and biodiversity changes,
7. sea level change,
8. desertification.

This list is not intended to be exhaustive of all the possible consequences or examples of global change; rather they represent those themes which are top priority for research in Canada, and about which we need to know a lot more in order to make reasonable policy decisions in this country.

Human impacts refer to the effects of global change on human socioeconomic systems. In some cases these represent direct socioeconomic effects of the biophysical consequences of global change; in others impacts are more indirect or tangential. Nine themes for priority research on the human consequences of global change were:

1. health,
2. production and consumption patterns,
3. use of land, air and water,
4. values,
5. population and urbanization,
6. international relations,
7. culture,
8. economy, and
9. food and shelter.

It is very difficult to plan for the future in the sense of being able to predict how future communities will adapt to and live with change. Not only are we uncertain about how global environmental systems work, we do not know the circumstances in which future communities will live or what values they will have. It can be concluded that these 22 global change themes represent an enormous body of data and knowledge, some of which have already been gathered and are currently being analyzed, and much of which is still in the process of being gathered or in the very early stages of research design. This type of research will involve precise and costly analysis and will depend on successful linkages among scientists and other researchers, policy makers, industry and nongovernment organizations. It will require the development of new tools and new institutions and perhaps most importantly, new forms of sustained research funding. The Canadian Global Change research community must carefully review the status of knowledge and the various disciplines which are relevant to global change and wherever possible extract that which can form a basis for effective policy and meaningful thought. Future research needs and results should be incorporated into current policy and decision making processes. There is a unique opportunity to integrate the work of natural and applied sciences, the social sciences and humanities and further to integrate academic and research work with community development.

Educational Considerations

I have already stated that the international programs and the focus given by the Canadian Global Change Program has and continues to have an influence on the teaching of environmental science at universities. Environmental science obviously is important throughout the whole university, and not simply in education, plant ecology or biology departments. It becomes equally important that lawyers should have an understanding of the environment as well as environmental law, that commerce students not only understand the economics associated with energy supply but further have some ability to understand the needs of carbon mitigation, and in my own College it is extremely important that people engaged in production agriculture do so with consideration to the sustainability of the land and the regional use of land which includes recreation as well as production agriculture. This has meant that there has been a quite rapid reaction for academic communities to the need for environmental training in all disciplines. Curriculum is being revised, and new interdisciplinary institutes or centers are being formed to deal with cross-disciplinary issues.

To give an example from my own university, in the Bachelor of Science in Agriculture curriculum, students may major in environmental science or may take environmental science as a minor when taking majors in Animal and Poultry Science, Applied Microbiology and Food Science, Crop Science, Soil Science, Agricultural Economics, etc. Students starting at the University deal with the earth's system as a whole before subdividing it and looking at human use of same. Sustainable agriculture is therefore treated from a soil and water perspective as well as from an economic viewpoint.

Another example would come from the College of Engineering where a research partnership has been formed between that College and the National Hydrology Research Institute and research can be focused on the hydrological cycle in the semi-arid prairies. Another initiative is between the Colleges of Agriculture and Law which have formed an interdisciplinary group which is currently called the Centre for Agriculture, Law and the Environment. Another initiative has been a study of the prairie ecosystem which looks at the manner in which people have used land and the effect of that land use on their communities, their income, their health and their way of life.

In summary, it would appear that it is vitally important for any university at the present time not only to have a good understanding in the life sciences on environmental issues, but that we attempt to sow the seed as to how the social sciences, economics, humanities and life sciences interact to provide us with a sustainable planet.

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Symposium Overview: Questions of Hope in Environmental Education

Peter Blaze Corcoran
Bates College, Lewiston, Maine

Organizer: Peter Blaze Corcoran, Bates College, Lewiston, Maine
Panelists: Delia Clark, Institute for Community Environmental Management, Wilder, VT
Carol Bylsma, Forest Song Associates, Phoenix, Arizona
Anna Brown, Freeport High School, Freeport, Maine
David Sobel, Antioch New England Graduate School
Annie Brody, Earth Force, Arlington, Virginia

> "All this joy, all this sorrow, all this promise, all this pain. Such is life, such is being, such is spirit, such is love."

This symposium is dedicated to the memory of Philip James Otis, a Bates College student who perished on Mount Ranier in a rescue attempt of an injured climber in the summer of 1995. Philip brought great hope to those who knew him through his commitment to the environment and his unabashed love of nature.

The symposium session was opened by Peter Corcoran who related the purpose of the session to the theme of the conference and in particular to the primary topic "to recharge the spirit and maintain the inspiration to work in this challenging field" . He explained the format of brief presentations each followed by time for reaction and discussion. He described the "gift of time" which was to leave the bulk of the session to the ideas and issues raised by the attendees.

Delia Clark's presentation dealt with the hope for a sustainable environment rooted in people's connection to their community, neighbors, and the land. She believes that these connections inspire us and give us the hope and motivation to act in environmentally responsible ways. In her work with communities, she has seen these connections to community and neighbors crumble, and trust is lost as a result. Delia believes that it is the role of environmental educators to strengthen this bond to the community and the landscape. Through their work they can increase hope and therefore motivation and responsible environmental

Carol Bylsma has been working with teachers and students for more than ten years on environmental projects and from this wealth of long term involvement she sees the hope every individual brings in their efforts to help their local environment. The programs she's been involved with include Project WILD, the Rivers of Colorado Water Watch Network, WILD Colorado Habitat Grants, and The Globe Program. She talked about her sense of inspiration from working with and seeing teachers' renewed hope once they received due recognition, and also from the accomplishments of high school students in their environmental research. She also sees hope in the statistics which indicate lower dropout rates, career choices related to the environment, and less job turnover in the teaching profession.

Anna Brown spoke about her activities in her community in Maine and the hope that she felt as a result of her accomplishments. She recognizes the actions she could take to bring about change and from that felt the motivation to take action. When she learns the issues and realizes how and where she can make a difference, she feels empowered and hopeful. She thinks educators can and should play the role of inspiring hope and encouraging students.

Educators should help young people learn about the issues, and allow them to take part in making decisions on the environmental issues to be addressed. She discussed her work with Concerns About Kids Environment (C.A.K.E.) and how they transformed their fear into hope and action, as well as her recent work as a Youth Advisory Board member of Earth Force. Anna recognized that when one is connected and committed to an issue and has the optimism to change, one becomes excited and is therefore more motivated to bring about change.

David Sobel talked about the importance of fostering in children a connection to the natural world. He believes we must encourage children to feel connected to their world on their terms — encouraging them to explore and connect to their own backyard. By involving them in something so close and personal an emotional relationship will be forged, which will inspire them to be environmental activists. In the macro sense, learning and worrying about abstract environmental problems only provides a sense of doom and hopelessness. If you impose the world's larger environmental problems on children, the problems become intangible and seemingly unsolvable thereby eliciting fear, depression and worry. This is alienates them from the natural world. Therefore, he believes the guiding principal should be "no tragedies before fourth grade". For children seven to ten, our goal should be to bond these children to their Earth. If we allow children to bond with the natural world slowly, without hurrying their knowledge of ecological problems, we will create a core of hope which will make them faithful environmental stewards.

Annie Brody discussed the value of environmental education for children and adults in holistic terms. Environmental education needs to address the "whole–being" of the person which is the feeling, creative, intuiting self, coupled with the analytical, critical thinking, information–gathering self. Hope is one of the few qualities to bridge the Cartesian duality – the left and right brain activities because, she says, "hope lives in one's soul but is informed and empowered by reality". The problem today with environmental education is its static roots in science–based education. We need to educate ourselves not only about the science of the environment, but also our relationship to the whole, natural, living, world. When a person truly feels, understands, and values this connection and learns the skills and knowledge to effectuate change, one is empowered to act, and thus hope is born. We are at a critical period in the history of humanity. We need empowerment and action; energy and zeal is the cure. If we could experience the intense aesthetic beauty of nature we would fall in love with it and therefore feel the strong connection to protect it. Students of all ages need to nurture their souls and participate in an education that fosters hope for the future and connection to our environment. This connection is essential if we want to achieve long–term survival and sustainability of the planed. It is vital as humanity is undergoing fundamental and profound redefinition as part of the evolutionary shift necessary for long–term survival and sustainability of the planet.

The session was powerful and evocative for many participants who shared questions, ideas, concerns, and stories over the course of the session. Many people who attended the conference sent their reactions to the panelists.

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Jim Bull of the Cuyahoga Valley National Recreation Area wrote about his interest hearing Anna Brown and how she began her campaign to ban styrofoam in her home town of Freeport, Maine by drawing mandalas. Jim stressed the importance of the arts in education. We believe arts allow the playful, intuitive self to emerge which brings one to the realm of the spiritual which is where hope always resides. By tapping into this part of the self, hope will naturally spring forth.

Martin Ogle found hope in the realization that those people involved in environmental education might be transcending the "crisis mentality" where we simply react to problems. He sees people as gaining a vision of life that is more positive and sustaining. He sees this through the people's realization that we can accomplish more, often by slowing down and living and working at a more humane pace. He also pointed out the importance of the arts which promotes creativity and development. He envisions a future where consumption of material goods and energy is a sacred privilege for survival rather than an end in itself. He gains hope further in witnessing people's renewed attention to their relationship with the Earth. He believes Earth is a living entity and therefore the human role becomes much more spiritual, creative, and important.

The symposium was very meaningful for Steve Pruyne. He was encouraged by not attempting to solve the problems of the world, but rather by concentrating on defining ourselves as caring people. He claims that we need to remember not to get overwhelmed and therefore lose hope in the face of the world's problems, but instead to enjoy our life in this environment and gather strength from it.

Lin Fry responded to the symposium by stating how important it was to love one another. By doing so, hope is rekindled and we are empowered.

Jenny Anderson wrote of the importance of being physically as well as emotionally connected to the environment, the people around you, and ideas. Through her teaching as a university professor she attempts to bring this awareness to her students.

Many expressed the opinion that the symposium, like last year's concurrent session on "The Significance of Hope in Environmental Education", provided a qualitatively different ethos than the majority of sessions. It was considered exciting that the exploration of these questions might continue in future years.

Symposium Overview: Working with Teachers to Build Sustainable EE Programs

Peggy Britt

National Consortium for Environmental Education and Training (NCEET)

Symposium Overview

The purpose of this symposium was to begin to define goals for EE inservice and to examine what key program elements lead to meeting such goals. It is hoped that this symposium will begin ongoing dialogues, research, and cooperative efforts to improve the effectiveness of EE inservice. This paper summarizes the symposium discussions and provides recommendations for those working in the field of EE inservice.

The symposium was opened with presentations from four EE inservice programs that have taken different approaches to EE inservice. These include: VINE Follow-Through Project sponsored by NAAEE, Ecological Citizenship (EcoCit) at the Chicago Academy of Sciences, and Washington State's Master Educator Program co-sponsored by the Washington Governor's Council on EE and NCEET. Brief descriptions of each of these programs are provided at the end of this paper.

Following presentations, participants and panel members discussed the goals and key elements of effective EE inservice programs. These discussions were recorded, summarized and used to draw some conclusions about new directions for EE inservice programs. Given these directions, participants identified key next steps for the field, barriers to overcome and directions for further work on the national level. This input is presented in the recommendations section of this report.

Goals of EE Inservice and Key Elements

An approach to inservice evolved from the program presentations and helped define goals for EE Inservice. Although each program used different approaches, each was striving for long-term, systemic change in participant teachers' curriculum by providing in-depth professional development and long-term support. Systemic change embodies not only content, but also pedagogy. Embodying students with the awareness, knowledge, attitudes, and skills necessary to become effective environmental citizens requires an infusion of an holistic environmental perspective, and experiential, community oriented learning opportunities throughout the school year. For most teachers, accomplishing these goals requires an extensive restructuring of their curriculum. EE Inservice programs should strive to fully prepare teachers for such an undertaking and support them through a process of redesign of their curriculum and a trial and modification period. Most participants felt the support elements of EE inservice are critical to empowering teachers to implement an ongoing, changing EE curriculum that meets commonly stated goals of EE.

Group discussion helped to further illuminate EE inservice goals by identifying key elements of EE inservice programs. There are many effective ways to approach both EE in the classroom and EE inservice programs. However, the key elements, summarized below, can provide a general direction for EE inservice programs.

- Focus inservice programs on a school or district level over 2-5 years to provide professional development and support over a complete curriculum change cycle.
- Assess long-term needs of teachers and administrators in a school or district.
- Mesh professional development/inservice efforts with educational reform efforts at the local, state, and national levels.
- Develop teaching teams that include teachers, community members, resource persons, and administrators.
- Focus workshops on empowering teachers to make real change through gaining both knowledge and skills and putting these to use in planning a new classroom curriculum.
- Create a support network for teachers that includes administrators, parents, businesses, and resource persons/organizations who can provide hands-on assistance and support for teachers.
- Evaluate programs based on long-term change in teacher practice and the effects on students.

Future Needs and Recommendations

After discussing key elements of effective EE inservice programs, each group discussed directions of changes for their programs, the barriers to such change, and how national organizations, such as NAAEE and NCEET could help local programs make positive change to inservice programs. The symposium was concluded by developing recommendations for areas of further work based on identified needs and barriers.

Given the long-term nature of systemic change efforts, inservice programs that wish to reach such goals will be faced with working with fewer participants over a longer period. Allocating resources in this manner is often contrary to the mandates of organizations providing inservice, such as government agencies that must show that they are serving their population. Also, current funding is often on a yearly basis or only supports a start-up phase. This type of funding and allocation of resources represents a major barrier to developing sustainable EE inservice programs. Allocation of resources and funding cycles should be developed with the goal of long-term sustained change in classrooms.

Adequate needs assessment is a key to any successful program. The needs of teachers, administrators and the community must all be taken into consideration. Due to geographic distribution and other factors, the needs of rural schools and school districts are often ignored. Teachers and schools in rural areas are often served by small not-for-profit organizations, such as nature centers. Symposium participants recommend that national organizations prioritize assessing the needs of teachers and schools in rural areas, as well as assessing the needs of small organizations providing direction and support for EE inservice before designing programs and materials.

Although several national inservice programs provide networking, there is not an umbrella organization that provides a network for all EE inservice providers. This creates duplication of effort and hinders communication and collaborative work for effective change. A national program should develop and maintain an EE inservice network to provide ongoing communication and a create a working group to define and overcome barriers to systemic change. One suggestion is to create an EE inservice affinity group within national EE and teacher support organizations, such as NAAEE, National Science Teachers Association, National Council for the Social Studies, and Association for Supervision and Curriculum Development.

Inservice programs are often evaluated based on the numbers of teachers served and how well the program was received by participants. Evaluating long-term impacts on teachers, classroom curricula, and students is often too complex or too costly for many programs to undertake. As new approaches to EE inservice emerge, new evaluation methodologies and tools must be developed to assess long-term success and identify the key components leading to systemic, sustained change. Evaluation research is needed to compare the longitudinal effects of different approaches to EE inservice. NAAEE's research committee and other research organizations could provide this evaluation services, identify further directions for EE inservice, develop new evaluation tools, and assess the needs of inservice programs.

The best use of teacher inservice time is to update and refresh teacher knowledge and skills. However, EE inservice programs must provide the complete education and support system for teachers working in EE. If more teachers are prepared to teach EE in their university training, resources for EE inservice can focus on updating and furthering teachers skills, and thus more effectively reach larger numbers of teachers. Before making large strides in EE inservice, preservice programs must keep pace with new pedagogical and content approaches to education, education reform, and effective teaching strategies. The EE field should make preservice a priority, develop stronger ties to schools of education, and work toward making EE content and pedagogy a integral part of teacher preparation.

Conclusions

This symposium was held to begin examine new approaches to EE inservice, begin to develop EE inservice goals, and to begin a discussion on directions for effective change. Given program breadth and the length of support participants identified as integral to successful EE inservice, it is likely that few programs are reaching the goals set forth in this paper. Common EE goals encompass providing students with in-depth environmental literacy, as well as instilling complex thinking, communication and action skills, and finally in supporting students in using these skills to becoming environmental citizens. Likewise, inservice programs must work toward giving teachers the knowledge, skills, and support necessary to enable them to develop integrated curricula that meet EE goals. Placing EE inservice programs in the role of striving to fulfill EE goals by meeting the diverse needs of teachers, administrators and the community, requires drastic changes in program content, direction and resources. The barriers to such changes are significant. The findings and recommendations in this report are preliminary. It is hoped that the symposium and this paper will spur further debate, discussion, and collaboration among EE professionals to improve and sustain EE inservice programs.

Inservice Program Descriptions

VINE Follow-Through Program

Since the 1980's Volunteer-led Investigations of Neighborhood Ecology (VINE) programs across the U.S. have provided teachers with trained volunteers who engage students in outdoor investigations, but most teachers only used language arts and reading activities to follow-up. The VINE Follow-Through Program developed by NAAEE in 1993 to encourage more meaningful classroom follow-up to VINE hands-on investigations. The notion was to create an inservice model that would increase the expertise of individual elementary teachers through a team approach, help foster a fundamental shift in their perception of and methodology utilized in classroom instruction, and enable teams to develop leadership skills to involve additional teachers in transforming their classrooms. The VINE Follow-Through project, funded by a National Science Foundation award, began with a team in Seattle, Washington. In the summer of 1995, the Seattle team held a workshop for Leadership Teams from two new cities. All 3 teams will gather at the end of the 1995-1996 school year to review successes, discuss barriers, and develop new directions for this inservice model.

For more information on the VINE Follow-Through program contact Karen Hollweg at NAAEE, (202) 884-8894.

Ecological Citizenship

Ecological Citizenship (EcoCit) is an urban environmental education program designed specifically to involve the participation of students, parents, teachers, and the community. At the heart of the EcoCit program is an environmental issues curriculum that leads and unites the community, promoting awareness, empowerment, and action. EcoCit provides a strong inservice education program for teachers. EcoCit instructors teach hands-on lessons in the teachers' classrooms to model environmental teaching strategies, techniques for issues-oriented learning, classroom management techniques that support science learning, and the development and support of student and community environmental actions. The aim of the program is to organize a collaboration of community, school, and business organizations to provide a solid foundation for long-term, community-wide environmental education/action programs. The goal is to empower citizens to make decisions about the mix of solutions needed to preserve the environment.

For more information on the EcoCit program contact Carol Fialkowski at the Chicago Academy of Science, (312) 549-0449.

The EE Toolbox Program

The EE Toolbox is a project of The National Consortium for Environmental Education and Training (NCEET), a program funded in 1992 by the U.S. Environmental Protection Agency. The EE Toolbox Program is designed to help existing networks of teacher educators to improve their skills and to create inservice programs that incorporate both environmental content and effective pedagogy. The EE Toolbox program underscores connections to important efforts in education reform. The program was developed with several types of teacher educators in mind: resource management specialists who to learn how best to work with teachers, those with classroom experience who need skills in teaching adults, and first-time facilitators as well as seasoned educators who wish to make their inservice programs meet the pedagogical needs of teachers.

The Washington State Governor's Council on Environmental Education is comprised of state natural resource and education agencies. The Council determined that agency staff can could become better resources for teachers if they understood the meaning of environmental education, improved their understanding of how students learn, and increased their own capacity to provide EE. The Council is using NCEET's EE Toolbox materials to define EE and to train agency staff how to approach environmental issues in the classroom, and how to help teachers integrate environmental content into curricular mandates. The first series of workshops has met with a better definition of resource agency roles in EE in the classroom an evaluation of current programs based on new knowledge and skills.

For more information on the EE Toolbox Project contact Peggy Britt at NCEET, (313) 998-6726. For more information on Washington State Governor's Council on EE contact Beverly Isenson, (360) 407-7333.

Symposium Overview: Reaching Urban Audiences

Karen Hollweg

North American Association for Environmental Education

NAAEE members working on environmental education programs with multicultural populations in urban settings have been discussing our experiences at conferences for the last several years. In 1995 we took this dialogue a step further through a symposium addressing the question: ***What are the essential characteristics for building and sustaining effective urban environmental education programs?*** Both funders and practitioners provided answers.

Funding agencies represented both the perspectives of the public and the private sectors. Panelists Teri Heyer from the USDA Forest Service's Northeastern Area, Kathleen Pickering from the National Fish and Wildlife Foundation, and Peter Howell from the Lila Wallace - Reader's Digest Fund each described their grant programs. They then provided a more in-depth view of their work by introducing the leaders of successful, on-going city projects they have funded, and these project leaders described their programs. Papers submitted by these presenters are printed immediately following this piece.

Several themes were repeated in these presentations.

1. Purpose - All three funders were motivated to invest substantial funds in urban programs because of a desire to promote stewardship and to connect urban residents to natural resources (e.g. forests/trees, wildlife, natural resources, local parks). They understand the importance of citizens being involved in their communities and want to build the people's capacity to act by helping them develop skills and understanding. They want residents to be empowered to manage their own future sustainability.

2. Keys to Success - Every speaker underscored the fact that partnerships are central to their successes. Collaborations included non-profits, community groups, corporations, youth groups, schools, school/boards, social workers , and government agencies as well as many committed individual residents, project leaders and staff members. Each project leader described a clear vision for their efforts and a long-term commitment to sustain that effort — building on each step and persevering. Diana Edmonds clearly described the daily realities of the Natural Guard's inner-city participants; Jeff Cole and Alex Corbluth explained how they create opportunities for high school students to both meet educational mandates and gain a variety of environmental experiences with people, work sites and recreational places outside the school; and Valerie Burns showed how Boston's Natural Areas Fund engages a real mix of urban residents in restoring and actively using city parklands and building a sense of community.

Following the panel's presentations, over thirty Symposium participants actively discussed their ideas about urban environmental education. In small groups, they identified:

- the most important aspects of the urban environment for urban residents to know, understand and get involved in,
- ways to make environmental education relevant for urban residents, and
- ways networking and infrastructure(s) can be enhanced to make urban EE successful.

Abby Ruskey and six facilitators Steve Bissell, Gina Blyther, Rebecca Brown, Carol Fialkowski, Bob Hubert, and Marisela Moreno led the groups in the use of the Adapted Nominal Group

Technique so that everyone would be allowed to participate and draw on her/his experiences equally "on a level playing field." During an hour of animated exchanges, the assembled practitioners actively analyzed what they've learned to date regarding urban audiences and education programs. The results of their deliberations have been summarized by Marta Cruz Kelly and are included following the panelist papers. For each topic there is a statement of the most important/highest priority ideas that that group identified and an inclusive list of all the specific ideas generated by the group's members. These ideas will be added to the input of urban EE practitioners from other forums conducted by NAAEE over the last two years to create a consensus document of urban EE guidelines, which will be presented at NAAEE's 1996 Conference.

Urban Outreach and the USDA Forest Service: Northeast and Midwest Examples

Teri Heyer
USDA Forest Service, Northeastern Area

Several examples of urban outreach as implemented through the United States Department of Agriculture (USDA) Forest Service's Natural Resource Conservation Education Program (NRCEP) will be highlighted. All projects are located within the Northeast and Midwest section of the United States.

Introduction

The NRCEP had its "rebirth" in 1989 when the National Association of State Foresters suggested that the USDA Forest Service strengthen its efforts in natural resource education. I say "rebirth" because the USDA Forest Service has a long history in conservation education but the emphasis on it had declined in the 1980's. Natural resource conservation education is defined by the USDA Forest Service as a life-long learning process that promotes the understanding of the natural resources and ecosystems, their interrelationships, conservation, use, management, and value to society. Emphasis is given to building critical thinking skills and fostering the individual's responsibility to conserve, preserve, and wisely steward our natural resources. No one specific audience has ever been targeted.

The NRCEP is administered in the Northeast and Midwest section of the United States by the USDA Forest Service, Northeastern Area, State and Private Forestry in partnership with the twenty State forestry agencies and the District of Columbia. Starting in 1992, funds have been available for each State and the District to develop a conservation education plan and implement the plan. In addition, in 1992 and 1993 competitive grant funding was available for local projects. I will address how the urban audience has been addressed in both the State conservation education plans and the competitive grant projects.

State conservation education plans

A conservation education contact person in the State forestry agency, or in some cases through USDA Extension Service, took the lead in developing a conservation education plan. Instructions were given to work with other educational and natural resource professionals in developing the plan. Four States: Illinois, Massachusetts, Missouri, and Wisconsin specifically mentioned outreach to urban audiences in their conservation education plans.

Illinois

The Illinois (IL) Department of Conservation plan focuses on promoting, strengthening, and expanding conservation opportunities involving current non-participants in natural resource programs. This will be done by developing coalitions with urban schools, urban churches, museums, park staff, senior citizens, and after school clubs (IL Department of Conservation 1993).

Massachusetts

The Massachusetts (MA) conservation education plan focuses on the urban audience by emphasizing quality of life issues such as air and water quality, noise pollution, toxic pollutants, nuisance wildlife, value of trees and open spaces (Jackson 1994).

Missouri

Missouri's conservation education plan emphasizes developing and pursuing activities that enhance the knowledge and understanding of natural resources by urbanites and groups of differing cultural backgrounds (MO Department of Conservation 1994). The MO Department of Conservation has facilities in the vicinity of both St. Louis and Kansas City where many hunting and fishing clinics are held. The Department also runs a nature center located within 40 minutes of St. Louis.

Wisconsin

Wisconsin's (WI) "Education and Wisconsin's Forest Resource" conservation education plan identifies the urban public as a target audience. Some key issues identified as of concern to the urban public include: the ecological, aesthetic, economic, and psychological benefits of trees; the importance of forests to the State's economy, forest management issues such as harvesting, biodiversity, and old-growth forests; the relationship between resource management and populations and consumption levels; and urban tree care and connection to the larger urban forest (WI Department of Natural Resources 1994.)

Competitive grants

In 1992 and 1993, funds were available to distribute for local projects on a competitive basis. Out of 46 projects funded over two years, a total of 10 had a specifically urban focus (USDA Forest Service, Northeastern Area 1994). Five will be mentioned here and one additional, The Natural Guard project, will be described in detail in the next paper.

USDA Forest Service Environmental Education Outreach Program

Since 1992 the USDA Forest Service hired college students as summer interns to meet with youth of diverse ethnic and socioeconomic backgrounds from inner-city and urban areas in order to share knowledge about natural resources and the USDA Forest Service by using a variety of hands-on activities. Over the past 4 summers a total of 58 interns have been hired and 19,000 young people ranging in age from 5 to 18 have been reached (USDA Forest Service, Northeastern Station and Area 1995).

Three key concepts have been learned through this program: a diversity of interns adds richness to the teaching team, meeting with and teaching the youth about natural resources helps them to understand their impact on their own environment, and repeat site visits give the time necessary to begin development of critical thinking skills.

Beyond the Cracks in the Sidewalk

"Beyond the Cracks in the Sidewalk" is an activity book developed by the IL Department of Conservation for grades 3-6. It includes activities about awareness, water, soil, plants, animals, and web of life. The correlations to IL State Goals for Learning are also included. Copies have been distributed to Chicago Public Schools and elsewhere around the State by the Department of Conservation.

Swallow Cliff/Youth Opportunity Corps

The project is a partnership between the IL Nature Conservancy and Forest Preserve District of Cook County's Youth Opportunity Corps. The Youth Opportunity Corps worked to restore the ecological health of a 40 acre wetland/oak woodland site within the 800 acres of Swallow Cliff Woods by removing invasive woody species, native seed collection and sowing, and conducting vegetation surveys. The additional USDA Forest Service funds allowed for the hiring of restoration supervisors who organized and coordinated daily restoration work, organized training about ecological concepts for all crews, and ensured the quality of the work in the field. Quality supervision is a critical factor in youth experiential programs.

Boston Career Exploration Program

In 1994 and 1995, groups of 9-10th grade students from the O'Bryant School of Math and Science located in Boston, MA, participated in a weekend field trip to the White Mountain National Forest and Hubbard Brook Experimental Forest, both located in northern New Hampshire. Activities included interviewing USDA Forest Service employees about career choices, assisting in the White Mountain National Forest's Aquatic Day, and visiting research sites at Hubbard Brook. For some students this was their first experience in a wilderness setting. This effort has lead to a desire from both the USDA Forest Service and the High School to be more involved with issues dealing with the urban environment.

Youth Build St. Louis

Youth Build is an organization that works with at-risk teens, helping them to earn their General Equivalency Diploma (GED) and learn a trade at the same time. Youth Build St. Louis utilized a USDA Forest Service grant to provide 60 hours of conservation education instruction, helping to fulfill the science requirements, while learning about the environment around them. Topics covered included: forest management and utilization, wetland ecology, wildlife, endangered species and biodiversity, and geology.

Conclusion

Several examples from State conservation education plans and grant projects illustrate how the NRCEP in the Northeast and Midwest has attempted to focus in on the urban audience. The biggest success has been in the many partnerships and cooperative relationships developed with a variety of environmental education and natural resource organizations: the Natural Guard, the Nature Conservancy, State Project Learning Tree and Project Wild coordinators, both the Morris and Morton Arboretums, and the Twin Cities Tree Trust, to name a few.

There are many challenges: maintaining funding in the midst of severe federal fiscal constraints, sheer numbers (over one-half of the entire United States population lives in the 20 State/District of Columbia area served by the Northeastern Area, State and Private Forestry), and there is still too much fragmentation and duplication of efforts. In order to face these challenges we will all need to learn to work together better, always seeking new partners, while maintaining those already making a difference in bringing conservation education to the urban audience.

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The Natural Guard: A Project Funded By the USDA Forest Service

Diana E. Edmonds
The Natural Guard

Grassroots in focus and global in scope **The Natural Guard** operates in the rainforests and Cayes of Belize, Central America; rural areas of Keaau, Hawaii; inner-city neighborhoods of Brooklyn, New York and New Haven, Connecticut and suburban towns of Westville and Brick Township, New Jersey and in Chester, Pennsylvania. Sixty percent of our members are African-American youth; 25% are Latino and the remaining 15% are a mix of Caucasian, East Indian, and Pacific Islander and Asian descent. About 70 % are boys and about 49% live below the poverty level. Some members live in shelters, group homes and foster care. Our EE focus therefore is determined by our constituency's reality and expressed need–acquisition of basic educational and social skills, exposure to a wide array of potential career choices, opportunities for after-school and summer employment, and collaborative campaigns with other youth groups and exposure to leadership training through participation in local and national community action.

In each locale we provide in-school, after-school and summer programs at no cost to children or their families. Although the focus of each initiative may differ, the thread that binds these branches of our family together is the common approach of community empowerment.

The activity common to all chapters is the transformation of vacant lots and/or illegal dumping sites into organic vegetable gardens. These activities build upon the knowledge collected in the field and classroom, providing the backdrop for exploring issues related to environmental equity, economics, nutrition and chemistry and opportunities for community service through neighborhood beautification and donation of produce to area food banks and soup kitchens.

In New Haven we offer the Tadpole Training Program during the school day, designed to acquaint area youth with the ecologies surrounding Long Island Sound. We also conduct lead awareness campaigns through use of a bilingual activity booklet created by children for children and community service activities such a storm drain painting, and bulb plantings and organic gardening. In middle schools we offer a more rigorous in and after school program call the Amphibian Training Program consisting of day-long field studies that provide opportunities to explore and evaluate transects in an upland forest, salt marsh, rocky intertidal and sub-tidal zones of Long Island Sound.

In Belize, members studied with Mayan healers and learned to identify medicinal plants; rescue plants when slash and burn activities take place in the area; establish a mahogany tree nursery with seeds gathered from the rainforest floor and have already distributed 1,500 trees to be planted throughout the country. They have adopted an orphaned jaguar cub at the Belize Zoo and caretake the shoreline of San Pedro Town on Ambergrys Caye. In Westville, New Jersey members have taken on the responsibility of caretaking Big Timber Creek; established a public nature trail and Elm Tree nursery at Wheelabrator Gloucester and spearheaded the demand for exclusive use of recyclables at their school cafeterias.

In Brooklyn, members have established an organic garden site that participates in global ozone monitoring and initiated a successful Hands-On-Science Outreach program that affords teen members opportunities to provide elementary school children introduction to basic scientific processes through games, field studies and experiments. Because we believe that the environment is everywhere one lives, works, plays or goes to school, issues of violence, child and substance abuse and truancy are germane to our programs. The following piece, which has been set to music underscores the environmental reality of many of our members and millions of other youth throughout the nation.

LIFE ON MY STREET

Life on my street. I'm so sick of it
Every day I see drugs being sold to strange cars
The buyers speed off, you can smell the burning tires

Even at night ,
You know the dealers are there
Car stereos so loud... like bass drums,
banging in your ears

Everyday ...trash is left on the ground
Whenever you pick it up,
More trash falls down.

Sometimes at night, when it is really quiet
It is so peaceful: it feels like a dream
Then all of a sudden...another argument breaks out
They yell about money... or food ...or something else – that's missing.

On some days, girls ten years and older, show off for the dealers.
To them - the dealers are
God's great gift to the Earth.

When the dealer asks them to get something , at the drop of a hat they go fetch it.

There's a skinny woman she who walks up and down the street...
She scrapes up anything... just to get a taste.

There's a girl, my age, everyone gossips about.
They call her the neighborhood slut.
Sometimes I feel ashamed, because
She's related to me.

People on my street think I'm the quiet girl.
I don't bother anyone . I just keep to myself.

I like the days when the blockwatch has a festival.
This is the day the street gets blocked off
and
The dealers are gone.   Even though,

Some people take them food, others brought to share.
I don't want to feed the dealers.

Life on my street goes by somehow
and I'm the quiet girl ----- watching it all go by.

Holly Walker, **The Natural Guard, New Haven CT. 1995**

NB. Holly and her friends have drawn our community's attention to interrelated issues of teen violence, urban forestry, neighborhood beautification, and hunger by creation of a grove of Famous and Historic trees and fruit bearing trees in memory of children who have died from violence.

The National Fish and Wildlife Foundation's Urban Initiative and a Premier Example of Its Funded Urban Projects

Kathleen Pickering, Alex Corbluth and Jeff Cole

National Fish and Wildlife Foundation (1), New York City High School for Environmental Studies (2,3)

The National Fish and Wildlife Foundation (NFWF) was established by an Act of Congress in 1984 as an independent nonprofit organization to further the conservation and management of fish, wildlife and plant resources for present and future generations of Americans. Since 1986, NFWF has made over 1,200 challenge grants totaling over $158 million in combined federal and private funds. The grant money that NFWF awards is federally appropriated, but all of NFWF's operating costs are covered by private donations.

The Conservation Education Initiative, the youngest of NFWF's five grant initiatives, is staffed by Kathleen Pickering, Initiative Director, and Rebecca Brown, Initiative Coordinator. The funding priorities for this initiative, established through a series of discussions with representatives from different sectors of the environmental education community, are as follows:

1. support effective delivery systems that provide educators with access to existing high-quality conservation education materials and programs;
2. provide current and future teachers with educational opportunities about the substance and technique of conservation education;
3. incorporate education about fish, wildlife and plant conservation into school curricula at the state and local level;
4. increase the educational uses of existing resources like public lands, parks, zoos, refuges and aquaria; and
5. encourage young people to pursue natural resource and conservation careers with special emphasis on creating a more diverse workforce.

The current goal of the Conservation Education Initiative is to bring these priorities to urban areas. The motivation for this Urban Initiative grew out of increasing policy conflicts over conservation issues. NFWF recognized that, due to increasing urbanization, most Congressmen and voters have no direct connection to the natural resources that NFWF's other Initiatives were working to conserve.

NFWF has been actively involved in bringing conservation education to urban audiences for the last three years. Some important lessons and challenges have emerged from NFWF's urban initiative. The first important lesson is that natural areas within urban centers have untapped potential for reaching new audiences with conservation education messages. For example, NFWF has worked with the San Bernardino National Forest, located between Los Angeles and San Diego, to create the first National Children's Forest. Through their Pathways to Stewardship program, urban children are actively involved in making management decisions about the condition and use of "their" forest, to help them grow up to be wise stewards to their urban natural resources. Youth are actively involved in creating the interpretive signs, leading interpretive tours, and serving as fire lookouts for the San Bernardino Children's Forest.

Urban school-yards present another opportunity to provide children in large population centers with formal hands-on environmental education. The Selbourne Project of the Roger Tory Peterson Institute uses the square kilometer surrounding urban schools in Louisville, Buffalo and New York City to explore nature and environmental issues in an interdisciplinary approach. This approach helps children appreciate the natural beauty within their own neighborhoods and understand their connection with the larger ecosystem. Similar successful programs include Project WILD's Schoolyard Habitat Guide, Project Learning Tree's Greenworks! and the VINE (Volunteer-Led Investigations of Neighborhood Ecology) program.

The second important lesson is that successful urban projects must integrate conservation education with building the capacity of the community to manage its own sustainable future. NFWF has worked to support "Service Learning Models" for urban young people with the Student Conservation Association, the National Association of Service and Conservation Corps, and the Earth Conservation Corps. These projects combine conservation education with job skills, educational support, and on-the-ground restoration work to foster long-term sustainable development for the community.

NFWF has also supported the work of The Environmentors Project, which matches at-risk urban high school students with adult mentors in scientific and natural resource careers to prepare a science fair project. The project has been successful in encouraging many of the students to consider pursuing higher education and science careers. Similarly, NFWF is funding the EnvironMental 2000 scholarship program, providing financial support and natural resource employment opportunities to minority students at George Mason University. The program serves as valuable experience for future employment and raises awareness among an urban student body that there are conservation careers in cities as well as in remote areas.

A final important lesson is that strong networks and meaningful partnerships are central to successful urban projects. NFWF is working with the US Fish and Wildlife Service to build a $5 million National Environmental Education Center on the John Heinz National Wildlife Refuge, within the city limits of Philadelphia. The goal of this project is to complement and enhance existing environmental education programs in the Philadelphia area by coordinating efforts and exchanging information and resources among a diverse group of school districts, nature centers, youth organizations, environmental non-profits, and local, state and federal agencies. The facility will be a by-product of the critical process of building partnerships to provide hands-on, outdoor experiences for inner-city children.

The biggest challenge of this Initiative has been establishing the relevance of wildlife conservation to urban communities. Programs that have been successful in suburban and rural areas often need to be adjusted to meet the needs of more urban, more multicultural audiences. For example, NFWF is supporting the efforts of Project WILD to conduct an urban needs assessment to improve their outreach to urban teachers. Establishing the relevance of wildlife conservation to urban audiences is now an explicit priority for the Conservation Education Initiative. NFWF is looking for creative approaches that establish the intersection of social, economic and cultural concerns of urban communities with concerns for wildlife conservation.

New York City's High School for Environmental Studies

One of NFWF's premiere examples of successfully reaching urban audiences through the formal education system is the New York City High School for Environmental Studies. Last year, the school moved to a newly renovated building, offering their students the best facilities to support their multidisciplinary approach to environmental studies.

The High School for Environmental Studies was launched in 1991 as a unique public-private initiative designed to provide students in New York City's public school system with the opportunity to enjoy a high quality academic program while they learn about the environment. The spirit of that initial design is embodied in the basic goal of the HSES – to prove that environmental education can be used to create a high quality, college preparatory educational program in a difficult urban setting. In the space that follows, we will briefly summarize the evolution of HSES before providing an outline of our environmental program.

The idea for creating a replicable model of urban environmental education was generated by the private sector in the person of Ed Skloot, the executive director of the Surdna Foundation. In 1990, through the support of the Surdna Foundation, the Council on the Environment of New York City developed a concept paper which built the case for the creation of a public high school built around concern for environmental themes and issues. This document was successful in convincing the Board of Education to support the creation of the high school the following year.

To help ensure the success of this initiative, an organization made up of prominent New Yorkers interested in supporting a public high school devoted to environmental studies was formed. This organization, the "Friends of HSES" has been instrumental in providing the support necessary to supplement funds allocated by the Board of Education. The Friends work to support the school by actively soliciting financial donations and in-kind contributions from outside parties and by helping to forge the partnerships necessary to initiate much of the environmental programming that makes HSES unique. Without the efforts of this organization, many of the environmental programs described below would be beyond our reach. Consequently, the private sector commitment which directly led to the creation of HSES is experienced daily throughout our school.

However, as a Board of Education-administered public high school in New York City whose overarching mission is the provision of high quality education services to our city's youth, the HSES offers a full range of state-mandated Regents, college- preparatory and special education courses. However, through the efforts of our outside partners we are able to supplement and strengthen these courses through offering the following unique array of environmentally-oriented programming:

1) Required courses -- Environmental Citizenship (9th grade) and Environmental Science (10th grade). These required courses are designed to provide HSES students with a broad introduction to today's environmental problems.
2) Infusion -- We recently completed the first stage in a multi-phased project which will result in environmental themes being infused throughout HSES' curriculum.
3) Upper level electives -- Through courses such as zoology, marine science, horticulture and environmental law, HSES students are able to explore areas of specific interest in environmental fields. These course offerings are constantly being revised to match student interest and staff expertise.

In addition to these more "traditional" classroom offerings, HSES also provides students with opportunities to develop interests in the environmental arena through after school activities such as clubs and internships. Many HSES students are actively involved in after school clubs like birdwatching, animal rights, horticulture and ecology. These student-initiated clubs allow students to work closely with both adult mentors and other students sharing their interests in specific topic areas.

Additionally, all HSES tenth grade students are encouraged to participate in a voluntary Internship Program. Students in this program are placed for a full academic year in internships with environmentally-oriented organizations such as Coney Island's Aquarium for Wildlife Conservation in Brooklyn, the Environmental Action Coalition in Manhattan and the Department of Environmental Protection. Student interns are required to attend weekly advisories where they learn about the demands of the job market, discuss their internship experiences with peers and explore career possibilities in various environmental fields. Students can also participate in a summer internship/job program which allows them to experience the environment and environmentally-related jobs first hand.

Through our combination of both school-based academic courses and external educational programs, we hope to begin developing the practical habits of mind necessary for our students to become environmentally-literate, successful citizens. However, as noted previously, the development of effective collaborations with outside organizations have been, and will continue to be, essential to our ability to achieve this goal. In an era of ever dwindling governmental support for public institutions it is even more important that we maintain our ability to effectively cultivate relationships with foundations, non-profit organizations and private sector groups that share our commitment to creating a successful model of urban environmental education.

Reaching Urban Audiences: Small Group Process Report

Marta Cruz Kelly

Earth Force

I. What aspects of the urban environment are important for residents to know, understand and get involved in, if urban EE is to be successful?

Group One's Summary of Most Important Ideas

An understanding of the urban environment as an *ecosystem*, which includes:

1. an understanding of the structural, political and economic relationships in the city and;
2. an awareness of municipal environmental management systems and;
3. sense of community history.

These understandings will lead to citizens taking ownership of the urban environment and empowering them to make informed decisions about community issues.

Specific Ideas Generated:

1. Aim to restore damaged relationship between urban and suburban communities.
2. Seek to understand built environment.
3. Demonstrate the economic dependence of cities on natural environment.
4. Create an understanding of the urban environment as an ecosystem.
5. Empower residents to improve local communities.
6. Encourage residents to take ownership of urban environment.
7. Develop an understanding of water issues within the community.
8. Develop a knowledge of local natural resources within the community.
9. Assist in increasing the capacity of the urban residents for decision making.
10. Convey a positive image of urban environment to those existing inside and outside of that environment.
11. Empower young people to make a positive contribution to the urban environment.
12. Discuss solid waste management in a community forum.
13. Discuss transportation issues in a community forum.
14. Work with schools and community groups to encourage the study of local plants and wildlife by youth and adults.
15. Examine structural/ political/ economic relationships in city.
16. Foster a sense of community history and demonstrate the evolution of the urban environment.
17. Encourage citizen awareness of municipal environment management, careers, health issues.
18. Encourage citizens' awareness of their power to make political decisions.
19. Develop awareness of ecological/cultural self within members of community.
20. Educate the community about the connection that food has to the urban environment.
21. Increase knowledge of citizens about existing projects and local activism.
22. Include components in programs which demonstrate that multicultural elements of a neighborhood should be valued.
23. People in the community are valued as a resource.

24. Kids are not only engaged in the learning process, but also serve as teachers to younger students.
25. Schools need to be fully involved.

II. What must be done to make EE relevant for urban residents?

Group Two's Summary of Most Important Ideas

It is essential that we engage urban residents in an equal partnership in designing programs and setting their agenda. Urban EE is a joint effort where urban residents are heard from, identify the issues, and are actively engaged in the program design. Programs for urban residents should be viewed as a tool for change and people involved are change agents. Any effort to create an urban environmental education program must commit adequate financial and human resources. The program must also work with the whole urban ecosystem.

Specific Ideas Generated:

1. Address genuine and immediate environmental education issues and needs.
2. Program must be fun from urban perspective/experience.
3. Co-plan with groups to achieve their community goals and environmental goals.
4. Seek collaborative educational efforts between students, educators, parents, local, state and county government, business and other EE organizations.
5. Concept of environment must be expanded to include built and unbuilt environments.
6. Urban EE must be linked to future opportunities (career, entrepreneurial, etc.).
7. EE for urban audiences must be seen as a tool for change.
8. We must understand and consider that urban means many things and has subtle contexts.
9. A person who is respected by the target audience should be involved.
10. Urban EE **must** include action that **resolves a problem**.
11. Must require resources that are realistically accessible to the community.
12. Urban EE should use relevant approaches.
13. More emphasis on future benefits.
14. Must teach skills and be action oriented.
15. Must have adequate staffing.
16. Must address diversity by recognizing it and responding to it with non-traditional approaches.
17. Urban EE must be born from audience perspective.
18. Seek to define and educate citizens about the process of funding from Congress through urban EE.
19. (Missing.)
20. Incorporate 11, 15, 19 under **broad resource heading**.
21. 17, 3, 7, 12, 18 - **audience perspective.**
22. 1, 6, 7, 10. 13 - **solving a problem.**
23. 3, 4, 17, 18 - **must address these goals.**

III. What is needed to enhance networking and infrastructure(s) for successful urban environmental education?

Group Three's Summary of Most Important Ideas:

1. A strong management plan includes goals (including needs assessment), objectives (measurable outcomes), strategies, evaluation.
2. Relevance to community.
3. Make the best use of communications technology and communication strategy.
4. Flexibility of approach.

Specific Ideas Generated:

1. Deal with community one-on-one and in a personal way.
2. A strong management plan is needed which captures all items of relevance, goals, objectives, evaluation, strategic plans.
3. Identify if you're Collaborating (sharing resources), coordinating (overseeing), or cooperating (some initiative; not totally sharing).
4. Produce a needs assessment and resource capacity among partners.
5. Create infrastructure of target roles for community groups (i.e., internships)
6. Seek community connections in implementation (i.e., neighborhood schools).
7. Make the best use of communications technology and a communication strategy (i.e., use hard copy and electronic to 1, collect, 2, catalog, 3, disseminate information).
8. Understand the formal and informal political environment within community.
9. Include flexibility in your approach.
10. Promote understanding of local, social, demographic and environmental issues.
11. Make the program relevant to the community and focus on the citizens' true needs.
12. Pre-service and in-service training of teachers is necessary.
13. Funding for networking function / event.
14. Training for all resource personnel in environmental goal on content, communication, and pertinence.
15. Quantify expectations of output and define product.
16. Establish a thorough evaluation process.
17. Manage the product process. Make sure you know what you want to accomplish and manage for outcome.

Contributed Papers

The Theater of the Environment - Curriculum Design for Environmental Justice

Robert Abrams

Cornell University

Six years ago, I began investigating how environmental issues have been portrayed in the theater. One year ago, I completed my Master's Thesis (Abrams 1995), which was based on my earlier groundwork. For my Master's Thesis, I developed a two hour workshop in which I combined concept mapping about environmental justice, with a participatory play reading, and a discussion about the play and the issue. This article will focus on those results of my Master's Thesis which relate to curriculum design.

Environmental issues are complex. So are the concepts which we use to explain these issues. To illustrate the nature of my participants' understanding, I place two flip charts at opposite sides of a room. On the first flip chart, I write the word "environmental". I ask the audience if they understand this word. Most people say they do, and my NAAEE Portland audience was no exception. I then ask the audience to suggest three words which help to define or describe "environmental". Next, I write the word "racism" on the second flip chart (it is related to "justice", but is more provocative). I ask the audience how many people understand "racism". The audience usually responds that they understand "racism" too. I then ask the audience for three words which describe "racism".

Next, I physically move one flip chart next to the other flip chart. I ask the audience if they understand the phrase "environmental racism". My NAAEE audience's reaction was consistent with the reaction of my Master's Thesis participants: they had a good idea of what environment was, and a good idea of what racism was, but were unsure of the phrase environmental racism.

The process I have just described, where I determined that the audience knew something about the components of an idea, but did not know the idea itself, is an illustration of one of the fundamental Ausubel-Novak ideas of education: the best way to teach is to first assess what the student already understands about a subject, and then teach from there (Novak 1977).

As a result of my Master's Thesis, I have developed a definition of environmental justice which I derived by combining the concept maps of several of my participants:

> Environmental injustice is a condition where people become trapped by society – by poverty, by their inability to move, by lack of information or education, by other people's patterns of consumption, and even by their own patterns of consumption. Once they are trapped, people are more likely to be unfairly exposed to a variety of environmental hazards. Some of this exposure may be visited on them purposefully, but this exposure can have been created unwittingly.

The curriculum design question then becomes "how can a teacher guide students from their current, incomplete understanding, to the full concept that the teacher is trying to teach?" Two valuable tools are concept mapping and anchor analysis.

Concept Mapping

Concept mapping is a technique where the teacher asks the student to describe the relationships between a main idea and its related ideas. Thus, rather than just listing words which help describe "environmental", the student would arrange the words on a piece of paper, and draw lines between them to denote the relationships. On each line, the student would write a word or phrase which describes the relationship.

In a situation where a student understands environment and racism, but does not understand environmental racism, a teacher might want students to construct their maps in two chunks. First, construct a map with "environmental" as the main idea, and then construct a map with "racism" as the main idea. Finally, the teacher would ask the student to create cross links between the two smaller maps.

During the NAAEE session, the audience suggested the following words:

Environmental: habitat, resources, connections

Racism: prejudice, exclusion, ignorance

I have constructed a two chunk concept map with one of its possible cross links (Ignorance to Habitat).

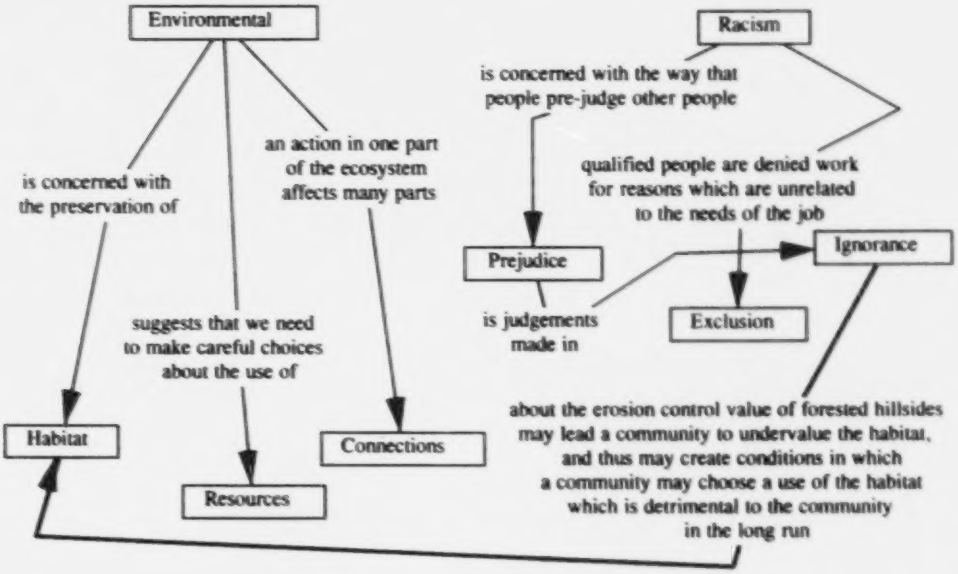
Environmental
Racism
is concerned with the way that people pre-judge other people
an action in one part of the ecosystem affects many parts
is concerned with the preservation of
qualified people are denied work for reasons which are unrelated to the needs of the job
Prejudice
Ignorance
is judgements made in
Exclusion
suggests that we need to make careful choices about the use of
about the erosion control value of forested hillsides may lead a community to undervalue the habitat, and thus may create conditions in which a community may choose a use of the habitat which is detrimental to the community in the long run
Habitat
Connections
Resources

Figure 1. A concept map of environmental racism based upon the audience's suggestions.

Anchor Analysis

Once a teacher has determined what the student knows about the subject matter (such as when the student draws a concept map), the teacher needs to decide how to teach from there. Anchor analysis provides a way forward: examine concept maps for understanding which is true or partially true, and ask the student to explore those parts of the map further. I will provide two examples of anchor analysis using concept maps drawn by my study participants.

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Participant P23 stated at the outset of the workshop that she had no idea what environmental racism was. I suggested that she concept map "racism." Looking at the sequence in her map consisting of [Racism] –> respect –> [Equality], I might suggest the following to help her understand environmental racism in a way which is anchored in her current understanding (See Figure 2).

If one treats other people with respect, people are more likely to be able to interact with each other as equals, and if people can interact as equals, exchanges are more likely to be fair and just. This concept chain relates directly to the classic case of environmental racism: the citing of toxic or hazardous waste facilities. A company comes to a community and says, 'We would like to build this hazardous waste facility in your community. It will be safe and it will provide the community with good jobs.' How is the community supposed to know if they are telling the truth? The company can certainly go and hire experts to argue their case, but if the community is poor or poorly organized, will they be able to afford a second opinion? Supposing that they do accept the facility, and several years later people start to get disproportionately sick. Will the community be able to take the company to court to get compensation? For a community like the one in Dumping Ground (Diggs 1982) – the play read in my study – the answer is probably no.

But how do you create respect? Environmental Equity can provide one answer. The participant wrote [intolerance] –> keep apart – distance –> [segregation], and [intolerance] –> fear –> [violence]. Respect is a wonderful goal, but the distance created by history, residential patterns, food choices and other differences, and the barriers created by fear are serious obstacles to respect. One way to overcome these barriers is to have people of different backgrounds work together on a common project. A project that could be potentially used for this purpose is the Global Rivers Environmental Education Network (usually called GREEN for short). GREEN (Mitchell and Stapp 1992) has classes from several school systems along a river or other water system learn how to collect and measure water for water quality studies. The students exchange their data and discuss their findings. In addition to the benefit of working together and seeing that the people from other schools are real people and not stereotypes, this kind of project has a benefit that derives from its environmental nature. Clean water is important for health. This aspect of the environment is independent of the color of one's skin. This is an example of environmental equity in the sense that both groups together take ownership and responsibility for a common resource.

As a second example of anchor analysis, consider participant P6's map. This participant not only has an understanding of environmental racism, but also is able to differentiate between environmental racism, equity, and justice. I would ask this participant: (See Figure 3.)

How do you define needless degradation? Can degradation ever not be needless?

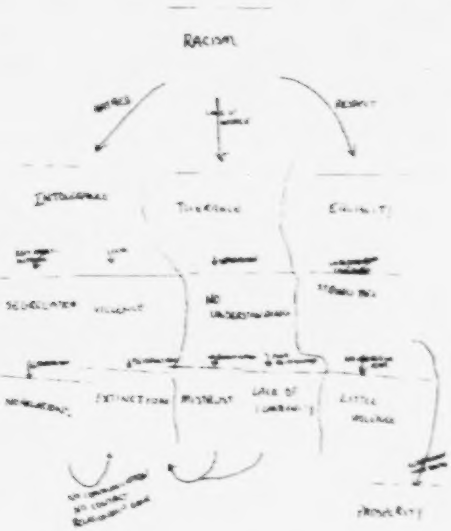
RACISM
RESPECT
INTOLERANCE
TOLERANCE
EQUALITY
SEGREGATION
VIOLENCE
NO UNDERSTANDING
EXTINCTION
MISTRUST
LACK OF COMMUNITY
LITTLE VIOLENCE
PROSPERITY

Figure 2. Participant P23's Concept Map.

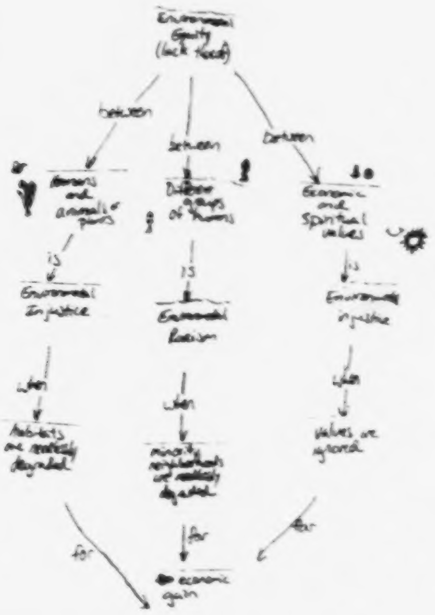
Environmental Equity (lack thereof)
between
between
between
Humans and animals/plants
Different groups of humans
Economic and Spiritual values
is
is
is
Environmental Injustice
Environmental Racism
Environmental injustice
when
when
when
habitats are aesthetically degraded
minority neighborhoods are aesthetically degraded
values are ignored
for
for
for
economic gain

Figure 3. Participant P6's Concept Map.

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The role of the theater

Real experiences are the most powerful way to teach people, but we can not always put students in the experiences we might like them to have. Some experiences may be difficult to create due to travel expenses. Other experiences may be valuable, but have risks which outweigh their benefits. Good playwrights have the ability to synthesize what was important about an experience. A good playwright can put this synthesis into a play so that a student can do more than observe that experience: the student can participate in the experience, and discover what it felt like to be there. The student is also able to participate in a larger number of experiences than would have been possible through the resources and happenstance of real life.

In contrast to much of schooling, the theater communicates the affective importance of an experience, as well as the cognitive importance of an experience. I recommend that educators integrate the arts and the sciences. Art is good for inspiring people and asking the deep questions that science ignores, but is not as good at being self critical and looking at the details.

I recommend an iterative process, where students would read a play, and then do research based upon the play. This could include social science research where students would ask "Are there similar issues in our community?", and physical science research where students would ask "What does the ecology of the habitat that the play takes place in really look like?" The science inquiry can then be used as the basis of new art which will present the students' findings to the community. Students can then take the new art, be critical, and do research, which would lead to new art, and so on.

My work as a resource for other environmental educators

My Master's Thesis contains reviews of 53 plays. These reviews describe the environmental issues each play addresses, and suggests ways in which the plays could be used as education. This allows someone in a school, nature center, or a theater, to find a play that deals with an issue they are interested in, and decide whether they want to read the whole play. I have also constructed an index which lists the length of each play, and the number of male and female roles.

My Master's thesis also contains two complete curricula which suggest ways that groups of plays can be taught over the course of a semester.

Educators interested in the Theater of the Environment do not have to restrict themselves to my curricula. For instance, NAAEE produces sets of materials designed to help people make choices about environmental issues. These Environmental Issue Forum materials could be used as a source of research on an environmental issue, which a teacher could then combine with a reading of one of the plays I have reviewed. In addition to considering the choice that the student herself might make, the teacher might ask the student to think about the choices she might make if she were one of the characters in the play.

Finally, Education, like Art, is never done. Just as there are new works of the theater which are being written, there are new approaches to teaching using the theater which teachers are trying out. I welcome correspondence about both new works of theater which address environmental issues, and new ways to use such works as education. After all, the play may be the thing, but a play with an audience is better, and an audience who is motivated by the play to communicate and create is best of all.

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Special Projects: A Sparkplug for EE

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"Special projects are active, practical learning experiences that enrich the curriculum of any discipline" (Lane & Rossow, 1993). A special project is an experiential-based approach to the curriculum that focuses on a project related to a problem, issue or need in the school or community, and it results in students taking some action on that problem or issue.

Characteristics of Special Projects

Special projects:

- Are student-centered - Special projects are student-centered in that they emphasize student involvement in all phases of the project. Students are involved in planning, implementing, and evaluating the success of their projects. The role of the teacher is to facilitate student learning by providing them with access to information and materials and providing guidance throughout the project.
- Are participatory - Special projects are hands-on projects that allow students to participate in meaningful ways. Students develop a variety of cognitive and manual skills as they participate in their project.
- Are interdisciplinary - Special projects are a holistic approach to dealing with problem-solving tasks of real life. They integrate the use of knowledge and skills from all subject areas.
- Involve community members - Community members are valuable resources to children's education. Special projects can tap into this resource and provide opportunities for the community to become more involved with the school and the school with the community.
- Involve most or all of the school - Special projects allow students and staff to interact outside the classroom in a productive learning setting that contributes to the school or community.
- Provide different learning opportunities at various grade levels - A special project can be adapted to many age levels and can be used as a source of lessons for students of various grades.
- Provide worthwhile learning opportunities - Special projects should be designed to incorporate the use and development of worthwhile knowledge and skills. Teachers develop lessons that ensure the project generates serious and important learning.

For example, a school garden project begins with students learning about plant growth and soil. Information about gardening may be learned from community members or older students. Teachers at different grade levels may focus on different aspects of gardening with their classes and their students may take responsibility for different areas of the garden or different gardening tasks. The learning process uses environmental education to integrate areas of mathematics, economics, art, science and language arts, including the use of native languages. In addition, cultural education will take place as community members share their knowledge about gardening with the students.

The Use of Special Projects in SMILE II

The SMILE II (Science and Mathematics for Indian Learners and Educators) project was a science and mathematics teacher enhancement project funded by the Bureau of Indian Affairs (BIA) for teachers in BIA schools in Arizona. The use of special projects as a central part of the SMILE II Program required school teams of teachers to work together to produce a change in their science and mathematics curriculum that was integrated with the school's whole language program. The special project also got the teams to think about how the community could be integrated into school activities and provided a high visibility result that had the potential to involve other teachers.

During the SMILE II summer institute, the teams developed a proposal to fund the purchase of materials needed to implement their special project . In doing so they were forced to think about what they wanted to do, how they would do it, who would be responsible for what activities and how much it would cost. Each member of the team created lesson plans for their classroom that were based upon and a part of the special project. In the fall, each team implemented as much of the project as possible, and in December, they submitted a report of their progress to date.

Selected Progress Reports from Three Schools

Each team was asked to submit a progress report on what they had accomplished by the beginning of December. Although not all goals of the projects could be met in that timeline every project had made significant progress involving many students. Many of the reports included photographs and examples of student work. A summary of selected progress reports is given below.

Cibecue Community School (Apache)

The Cibecue SMILE Team has accomplished the following tasks towards the development of a nature observation area:

- Installed weather observation equipment.
- Fifth grade students have conducted soil tests of the area to guide the selection of plants for attracting wildlife.
- Recruited more that ten school and community members to assist with the project.
- Worked with the local medicine man for guidance in identification of native vegetation.
- High school students have constructed benches and tables for the area.
- Acquired seeds for planting in the spring to grow plants for attracting birds and small animals.

More than 75 students from grades 5, 6 and the high school have been involved in the project so far.

Seba Dalkai School (Navajo)

The Seba Dalkai Garden Improvement Project has provided a focal point for the whole school. All 180 students are involved in the project as are all teachers, aides, staff, and many community members. The principal, Dr. Calsoyas, has donated a composting drum to the project and Tom Begay, a maintenance worker has built the cold frames for the project.

The kindergarten and pre-first students have studied and raised worms. Soil testing was done by the second grade students who have also studied differences in soils and have worked with clay. The second grade also studied seeds, especially sunflower seeds from the garden. In the first and third grade classrooms, students have studied plant growth and planted in the cold frames. The first graders hoed and weeded in the garden and harvested some of their crops. The third graders studied seeds in preparation for planting in the cold frame. Students in the upper grades have been studying composting and the decay of different materials (paper, manure, and kitchen garbage) and cycles, such as the water, nutrient, and oxygen cycles. In addition, they have been studying how to use compost to enrich soil.

The project also stimulated one of the teachers to submit a grant proposal to the National Gardening Association for tools and other support to expand the garden.

Second Mesa Day School (Hopi)

In August, the team met with the school principal to present the project plans. This meeting was followed by a presentation at a staff meeting where five other staff members agreed to help with the project. The team also expanded the use of the worm bin project to four classrooms. The team then met with tribal recycling and waste management officials to refine their plans. The Hopi Tribe has furnished recycling bins for the project. Can crushers have been installed in three classrooms. The project has involved 269 students in grades kindergarten through eighth, four teachers, two teacher aides, and three tribal officials including the vice-chairman. Students have participated in a campus litter clean up campaign, raised worms, collected and crushed cans for recycling, and made plans to participate in the "Adopt a Highway" program.

Summary of Results of SMILE II Special Projects

Based on the contents of the progress reports and the SMILE staff site visits, we have noted the following:

- Very high level of implementation. Every school involved in this program has implemented their special project.
- Increased student involvement. At each school, students have become actively involved in their leaning through the special project. Environmental education is coming alive for students at these schools.
- Greater collaboration among teachers, administrators and community members. The implementation of the special projects has required a greater level of team work than typical classroom based teaching. The team work has extended beyond the teachers to administrators and members of the community. Parent nights have been started by this program at some schools.
- Interactions between students at different grades. Several of the projects have involved students from upper grades working with and teaching students at lower grades. In some cases this interaction has occurred among students from different schools.
- Involvement with tribal government. Two of the schools have become involved in tribal activities and teachers are working with tribal officials in their implementation of their special projects.

- Teams providing inservice workshops. Many of the special projects have been presented to the whole school staff during inservice workshops.
- Seeking new resources and funds. Team members have used their proposal writing skills to seek additional funds for their special projects or to obtain additional instructional materials.

On the basis of these findings, we recommend the use of special projects for promoting environmental education in schools. It can be a powerful way to go beyond the school and involve parents and community in the education of the children.

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"Give Water a Hand" Synergism: Alliances for EE Programs

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Give Water a Hand Program Overview

Give Water a Hand is a national, community-based water quality education program for young people ages 9 - 14. The goals of the program are:

- To protect and improve local water quality and quantity
- To involve young people in investigation and action on local water problems
- To support young people in using their existing skills and interests
- To encourage voluntary action
- To focus on watersheds as a unit of study for solving local environmental problems
- To encourage links between youth and community natural resource professionals

Give Water a Hand began in 1994 with coordination by the University of Wisconsin. In the first six months of the program, five program guidebooks were written and produced to help youth leaders and young people achieve these goals. The guides consist of a Leader Guidebook (with background information and resources) and four Site Action Guides for youth, each focusing on a different project site -- home, community, school, and farm/ranch. Though a service-learning method, these materials provide the steps young people need to identify local water issues, and to plan and implement service projects to address a problem they've identified. In addition, the materials help young people link with local water experts and help local resource people conduct effect outreach to youth.

Give Water a Hand Partner Alliance

An important key to the success of Give Water a Hand was the development of a national alliance of stakeholders (partners) in development and dissemination of the program. Over 25 national organizations and agencies, including USDA, Trout Unlimited, and Water Environment Federation, developed the key concepts for Give Water a Hand based on their own water education goals and efforts. (An example of one goal shared by partners is that water education should emphasize watersheds as a unit of study.) This collaboration in materials development gave partners a reason to invest in the project. As a result, partners own the program and actively promote and disseminate the materials and provide opportunities for training.

By using their existing networks and resources, partners made the level of program participation greater than what would have been possible alone. Partners worked together to help one another; one, for example, providing others with fund for printing. With partial funding from a corporate sponsor, public agencies worked alongside private non-profit organizations. The effect of this collaborative effort was synergistic; funds leveraged more funds; support from one partner made it possible for another to participate and bring in unique contributions; high quality materials were disseminated to more young people.

Background of Give Water a Hand

Give Water a Hand was developed, in part, in response to a recent USDA study (Andrews 1992) which identified the following water education needs: 1) to help youth to act, 2) to nurture in youth the skills of environmental stewardship, 3) to make environmental issues immediately relevant for youth, and 4) for a collaborative approach to water-related environmental education. In addition, during review of water education programs as part of a further study, it was determined that the very best water education materials are those where young people are linked with local natural resource experts for ideas, information and resources.

Two ideas are basic to Give Water a Hand: individual, voluntary actions can make a difference and local natural resource experts are one key component to successful programs. As adults, we know there are problems in the environment that need our attention, but we don't always take actions to improve the problems or we don't know how to help. Research shows that young people have similar concerns about the environment and that they also want to help ("Children and the Environment" 1993). What we *can* do therefore, is support young people as they practice what to do and make commitments to act. The steps in Give Water a Hand provide youth with a way to make their own decisions of how to help, using their own unique skills and interests.

The Give Water a Hand Site Action Guides are, then, guides for planning community action. Rather than producing a water education curriculum, the Give Water a Hand developers sought to provide young people with the skills needed for effective action. To assist participants with information on water management issues, the Give Water a Hand guides direct youth to the large number of excellent curricular resources already available, and to obtain information and resources from local partners.

Benefits of Give Water a Hand

For young people:

- learn about family and community water quality and conservation issues
- make a difference to real-world problems
- learn and practice life skills
- gain exposure to natural resource management careers

For organizations:

- address an issue of concern to youth
- tap the resources of a national network of experience water professionals
- be recognized for their efforts

For communities and the environment:

- involve youth in addressing real water-related needs through service projects
- gain youth who are active citizens and stewards of the environment

Acknowledgements

Major sponsors of Give Water a Hand are Church & Dwight, Co., Inc., National Fish and Wildlife Foundation, USDA CSREES and University of Wisconsin. Additional support is provided by the Give Water a Hand partners.

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Evaluating Sustainability Projects

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Introduction

It is important to profile, evaluate, and disseminate information on innovative sustainability projects. To accomplish this task, the "Environmental Analysis in Planning" course of the Department of Planning, Public Policy and Management, of the University of Oregon, profiled and evaluated thirteen of the most notable "sustainability" projects – most in the Pacific Northwest.

The analysis was accomplished in much the same manner as alternatives analysis in modern environmental impact assessment – a scaling-weighting analysis.

The purpose of the project was to provide feedback on program development and implementation to the sustainability programs to facilitate similar initiatives in North America.

Methodology

A model set of principles of sustainable development were obtained from the Global Tomorrow Coalition (GTC, 1995) and Hartig and Hartig (1994). The principles are:

- long range planning and intergenerational responsibility - assessing future needs against current demands in order to sustain global economies and the environment.
- carrying capacity - resource utilization in a rate and manner that does not destroy the natural environment in the long run.
- anticipation and prevention - proactive planning and prevention are more efficient and less costly than reactive (end of pipe) solutions.
- full cost accounting - incorporating all economic, social and environmental costs into the price of products - including future costs (e.g. decommissioning and waste management).
- economic, environmental and social integration - multi-purpose, multi-objective, multi-stakeholder evaluation and decisionmaking (see Johnson, 1993).
- efficiency, innovation and continuous improvement - monitoring, feedback and remedial efforts to continually improve systems.

The class came to the conclusion that "actions speak louder than words," and that program implementation processes were equally as important to our evaluation as sustainability principles. Thus a second analytical data set was established to evaluate program implementation. By adopting and modifying implementation criteria from the strategic planning literature, total quality management (TQM) principles and the sustainability literature (Hartig and Hartig 1994; GTC, 1995), the following eight implementation criteria were evaluated:

- stakeholder involvement - all relevant stakeholders were involved from the onset in a consensus decision-making process
- leadership - project leaders should be committed to the vision, decision processes and provide the necessary resources for project completion
- information and interpretation - participants must agree on information needs and methods of acquisition and interpretation. Information should be distributed equitably to all stakeholders.

- planning - continuous improvement through goal setting, analysis and decision-making. All plan elements should be internally consistent and mutually reinforcing.
- human resource development - sufficient resources should be made available for education and training for mutual cooperative learning.
- results and indicators - proper selection of a menu of measures and indicators to adequately track project progress.
- review and feedback - analysis and feedback on performance and satisfaction as a basis for project adjustment and correction.
- stakeholder satisfaction - all participants perceive that progress is being made to achieve project goals and objectives.

Because of strong beliefs that some of the sustainability principles and process criteria were more (or less) important to program success, the class utilized a modified delphi process to differentially weight the various principles and criteria. Research teams were then established to select, profile and analyze the success of thirteen sustainability projects to create the scaled and weighted analysis.

Results

Table 1 presents the summary scaled/weighted checklist of seven of the thirteen projects (the seven best projects are presented). These projects, in no rough order were:

1. The Pacific Rivers Council (**PRC**) - work to analyze, protect and restore rivers in the Pacific Northwest - Eugene, Oregon (see PRC Quarterly).
2. The **Siuslaw** Institute of Watershed Arts and Science - Mapleton, Oregon (see Sunstrom, 1994).
3. The **Applegate** Partnership - promote natural resource management to promote ecosystem health in Southern Oregon (see Preister, 1994).
4. The **Willipa** Alliance - promote proper coastal resource management. Willipa Bay, Washington (see Colby, 1992).
5. The **Newberry** Geothermal Pilot Project - impact mitigation of a proposed new geothermal plant near Bend, Oregon (see USDA, 1994).
6. Sustainable **Seattle** - community sustainability project in Seattle, Washington (see Sustainable Seattle, 1994).
7. Oregon **Benchmarks** - statewide progress indicators projects, Salem, Oregon (see Oregon Progress Board, 1994).

Table 1. Summary of Process and Principles/Analysis of Seven Northwest Sustainability Projects

		PRC		Siuslaw		Applegate		Wallipa		Newberry		Seattle		Benchmarks	
Total Quality Management (TQM):	**Weights**	Scale	Total	Scale	Total	Scale	Total	Scale	Total	Scale	Total	Scale	Total	Scale	Total
• STAKEHOLDER INVOLVEMENT	10	10	100	5	50	10	100	10	100	10.0	9	8	80	10	100
• LEADERSHIP	4.4	8	35.2	6	26.4	10	44	10	44	4.4	7	10	44	10	44
• INFORMATION AND INTERPRETATION	6.0	10	60	7	42	8	48	10	60	6.0	9	8	48	10	60
• PLANNING	7.6	9	68.4	8	10.8	8	60.8	10	76	7.6	8	9	63.4	4	30.4
• HUMAN RESOURCE DEVELOPMENT	2.4	9	21.6	4	9.6	9	21.6	8	19.2	2.4	n/a*	7	16.8	3	7.2
• RESULTS AND INDICATORS	2.8	8	22.4	0	0	7	19.6	9	25.2	2.8	n/a*	7	19.6	10	28
• REVIEW AND FEEDBACK	5.2	9	46.8	0	0	5	2.6	9	46.8	5.2	8	7	36.4	9	46.8
• STAKEHOLDER SATISFACTION	1.2	6	7.2	0	0	9	10.8	7	8.4	1.2	8	8	9.6	7	8.4
	TQM Totals	361.6		188.8		330.8		379.6		286.8*		322.8		324.8	
Principles of Sustainable Development:															
• LONG-RANGE PLANNING AND INTERGENERATIONAL RESPONSIBILITY	10	10	100	8	80	8	80	9	90	10.0	7	10	100	10	100
• CARRYING CAPACITY	4.8	7	33.6	4	19.2	5	24	7	33.6	4.8	7	10	48	8	38.4
• ANTICIPATION AND PREVENTION	7.1	10	71	6	42.6	7	49.7	8	56.8	7.1	9	10	71	10	71
• FULL COST ACCOUNTING	6.2	10	62	9	55.8	5	31	8	49.6	6.2	7	8	49.6	10	62
• INTEGRATION OF ECONOMIC, SOCIAL, AND ENVIRONMENTAL FACTORS	6.2	9	55.8	7	43.4	10	62	7	43.4	6.2	6	10	62	10	62
• EFFICIENCY, INNOVATION, AND CONTINUOUS IMPROVEMENT	7.6	10	76	8	60.8	8	60.8	10	76	76	8	8	60.8	10	76
	Sustainable Totals	398.4		301.8		307.5		349.4		308.9		391.4		409.4	
	Grand Total	760		490.6		638.3		729.0		595.7		714.2		734.2	

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The class assigned numeric weights to the principles (0 = least important; 10 = most important), and the teams scaled the case study performance from their analyses (0 = least activity; 10 = most activity). It is important to note the subjectivity of the weights and scales in the overall results. For example, the class weighted stakeholder involvement as a "10" and stakeholder satisfaction as only a "1.2"! Further, the teams did not use identical criteria for assigning numeric values in scaling. Thus, a different class would likely have achieved a different result. However, it is the process, professional feedback and information dissemination that is important and not an absolute reading of the numeric results.

Table 1 is split into the process (TQM) and principles subsections and a grand total of both at the bottom. The PRC, Applegate and Willipa received the highest process ratings with the PRC, Seattle and Benchmarks receiving the highest ratings for sustainability principles. By combining the scores, the best projects for both "saying" and "doing" sustainability initiatives were the PRC, Willipa Alliance and Oregon Benchmarks.

Conclusion

All systems need monitoring and feedback for adjustment or corrections. As the "sustainable development" movement gains momentum and moves from words to action, researchers and educators can provide valuable information on program development and evaluation to foster improved project conceptualization and implementation. Use of such evaluation in college level classes is a very valuable investigative and evaluative experience for students at the cutting edge of community development.

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Environmental Education For Mexican Rural Communities

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Consejo De Mejoramiento Ambiental, Queretaro, Mexico

Summary

The *Consejo de Mejoramiento Ambiental* is working in the State of Queretaro, Mexico. One of its more important projects is environmental education for rural and semiurban communities. It produces educational material, prints and radio, adapted to their culture, problems and educational level. The main objective is to improve quality of life in the communities through adequate exploitation of their natural resources.

Mexico

Mexico is situated in North America, bordering the United States. It has 80,000,000 inhabitants concentrated in the capital cities; especially in Mexico City, which is the most populated and polluted city in the world. There are also thousands of rural, isolated, small communities.

Mexico has four ecological zones: arid, temperate, humid tropic and dry tropic. That is the reason Mexico has deserts, jungles, forests, high cold mountains, coral reefs, and enormous biodiversity. Mexico has seven biosphere reserves, more reptile species than any other country in the world, and breathtaking beauty stretching hands with huge problems.

Queretaro

The Consejo de Mejoramiento Ambiental, is working in the state of Queretaro, in the center of Mexico. Our territory is 12,000 km^2, most of it arid zones, and the rest different types of forests.

The total population of the state is 1,200,000, in 18 districts. Two of them contain 800,000 people, the rest of the population is distributed in small rural and semiurban towns.

The basic problem is common to forests and deserts: people are destroying resources and they become poorer with time. The problems we are working with are:

Water and soil pollution
Open air rubbish dumps (garbage is thrown in natural holes)
Deforestation (cooking with wood)
Defecation in open air, that causes sickness and pollutes the air and water.

Consejo de Mejoramiento Ambiental

Our environmental group, that I will call *The Consejo* designed a practical course for rural and semiurban environmental promoters. These promoters are persons who work in primary schools or outside with women, men and youngsters, to improve the environment and the quality of life of the inhabitants.

We coordinate and receive the assessments of private and public universities in Queretaro, departments of the government that are related to ecology, and environmental groups; especially the Sierra Gorda group which sponsored part of the materials and has been using them for one year.

Environmental Education

The course is organized in separate modules that can be taught in different ways. The promoter adapts them to the time he will be working in the community, the problems and interests of the participants, the characteristics of the group and the ecosystem. We do not teach the same to women who can hardly read or to 8th grade students.

The contents of the Modules are: Air, Cycles and Chains, Ecological alternatives, Ecosystems of the world, Energy, Flora and fauna in Queretaro, Garbage, Global problems in the world, Health and pollution, Legislation, Nutrition, Soil, The desert, The forest, Water. All the modules have four parts: Objectives, Contents, Media, Activities.

The **objectives** have always a practical part that describes what the participants will do to improve life in the community. For example, when they study The Forest they reforest, receive orientation for exploiting wood in a sustainable manner and build rural stoves that consume less wood and are healthier than the ones they traditionally use.

The **contents** are simplified and related to their community.

The **media** is a description of how to use the materials we are producing to support this program. There is also a list of prints, radio programs and videos available in Spanish related to their context. This is important because most of the information is either in English or translated from English. It is complicated and very far away from the reality of these communities

Imagine an Indian town in Amealco Queretaro hearing about the tons of garbage produced in New York or Chicago.

In **activities** we suggest several activities for different ages, so they can chose the ones they want to improve their community. For example, when studying The Forest, the children create a nursery, woman organize to build their rural stoves and men reforest.

The educational materials we have been producing to help the promoters are:

- Manuals with the basic contents for each module
- Journals for the youngsters
- Radio programs

The manuals are written in simple language, with illustrations and examples related to the reality of Mexico and Queretaro. They are used as textbooks by the promoters. The promoters do not have very high literacy; some of them have studied 9th grade, others are primary rural school teachers.

For example, the manual *How To Take Care Of Your Garbage* (Manejo de Residuos) tells them about the danger of garbage thrown outside, how to separate it, where to recycle and how to do composting. The 8 page journals and 40 minute radio programs have been designed for rural children between 10 and 15 years old.

The promoters give each child its journal and all work with it together. An example would be: Watch the drawings. What do you see? Here they learn how and why they have to separate the garbage (Figure 1). The journals have educational games (Figure 2).

In this example they play and at the same time they learn the names of the different districts of our State, where they can take their separated garbage, and where the non-recyclable garbage is best kept. Here most people do not separate garbage, the open air rubbish dump in the capital city is still there, and the recycling centers began to be set last year.

All the journals have stories related to the theme. In the example, the banana is furious because after it has been eaten, people want to treat it like garbage. The banana peeling feels he is very important, so he promotes composting to continue being a useful banana. Similar stories are presented with glass and aluminum. (Figure 3).

There is also a comic. In this case the rats are talking about their nice home: rotten, stinky, with lots of friends that happen to be the diseases caused by open air rubbish dumps (Figure 4).

In the mail section we publish letters from different kids. There are also sections of information. There is an evaluation, that the promoter can use individually or in groups (Figure 5).

The radio programs are related to the journal. They always have an interview with a fictional character; a story with different characters, music, sound effects and an ecological song.

In the radio program of this example the owl and the bananas hear the voices of the air, soil and water that are dying because of pollution. They take a boy to a nature judgment, he is declared guilty. He accepts the charges and works to organize cleaning up groups. He has to fight against the witch of destruction who tries to make people apathetic.

Since last year we have been working in the north part of Queretaro with the Sierra Gorda Group with 150 communities, about 15,000 children. This year we began to train promoters who are working in arid zones. Other groups have been asking for our materials to work in schools and communities in the city of Querétaro.

We have produced less than half of the materials we have planned, and we do not have enough for all who need them. We can not pay the promoters and volunteer work is uncertain. We need funding.

But everytime someone says: "I will never again throw garbage into soil nor water, will not use detergents, let's build our rural stoves and latrines, etc. " we know all our effort is worthwhile.

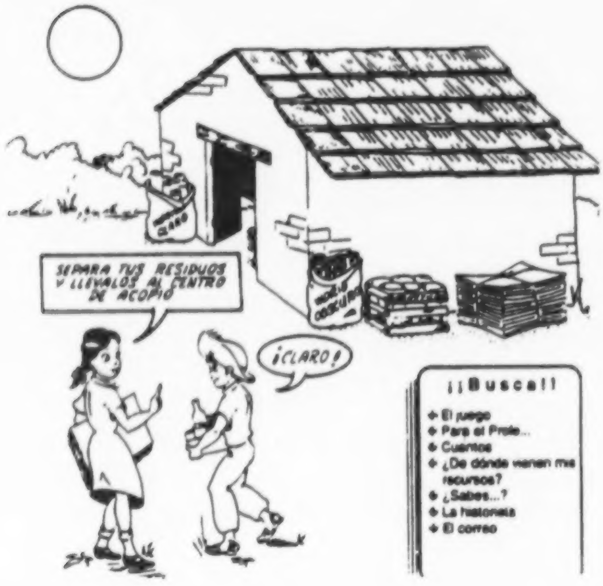
SEPARA TUS RESIDUOS Y LLEVALOS AL CENTRO DE ACOPIO
¡CLARO!
¡¡Busca!!
El juego
Para el Profe...
Cuentos
¿De dónde vienen mis recursos?
¿Sabes...?
La historieta
El correo

Figure 1

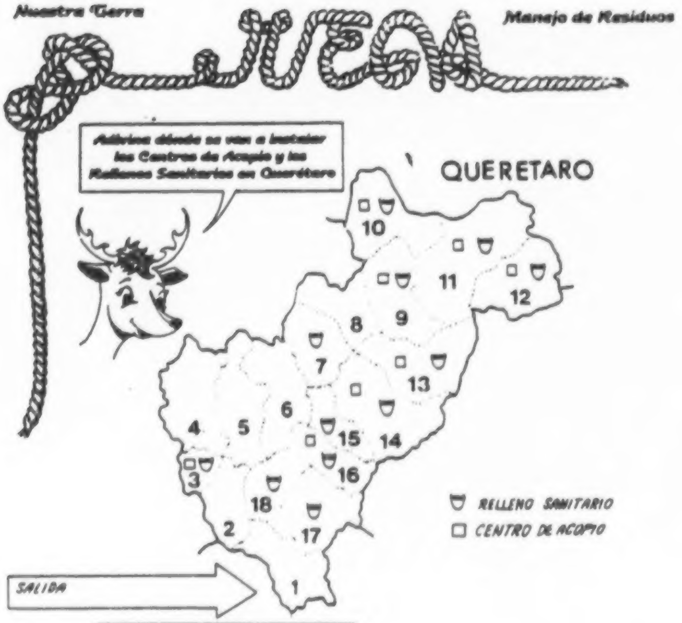
Nuestra Tierra
JUEGA
Manejo de Residuos
Adivina dónde se van a instalar los Centros de Acopio y los Rellenos Sanitarios en Querétaro
QUERETARO
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Figure 2

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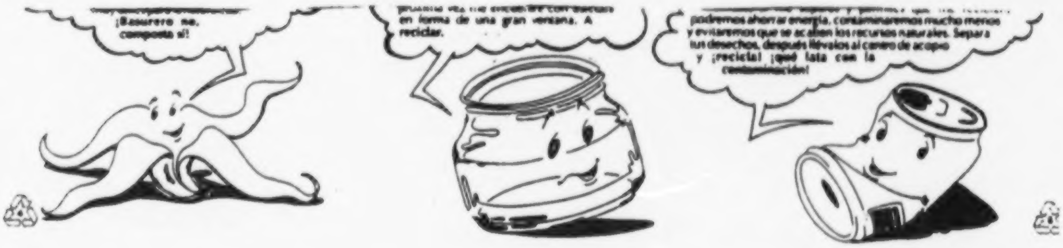
¡Basurero no, composta sí!
en forma de una gran ventana. A reciclar.
podremos ahorrar energía, contaminaremos mucho menos y evitaremos que se acaben los recursos naturales. Separa tus desechos, después llévalos al centro de acopio y ¡recicla! ¡qué lata con la contaminación!

Figure 3

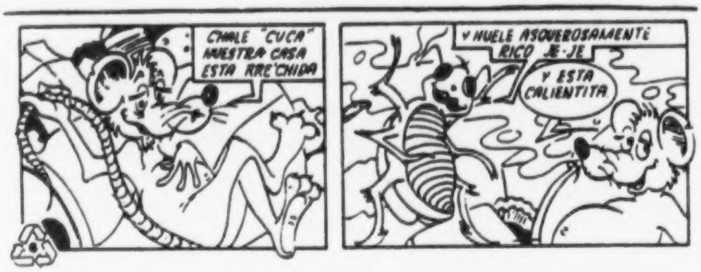
CHALE "CUCA" NUESTRA CASA ESTA RRE'CHIDA
Y HUELE ASQUEROSAMENTE RICO JE-JE
Y ESTA CALIENTITA

Figure 4

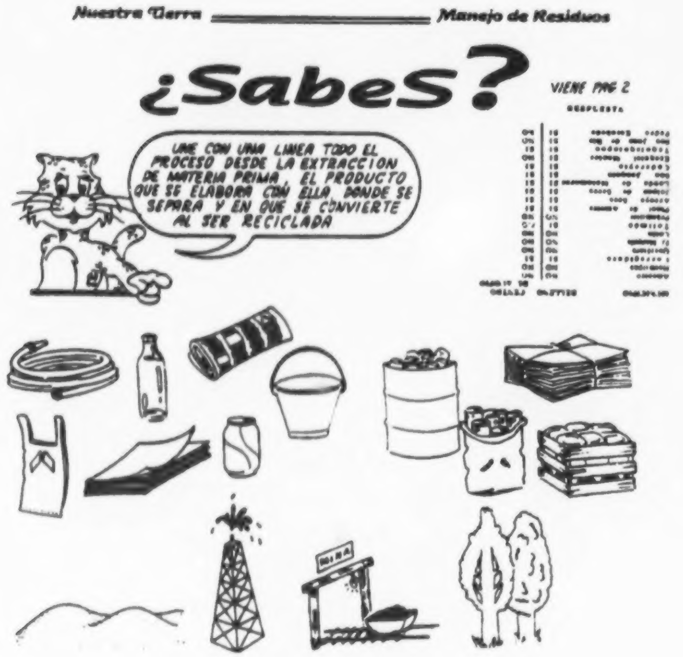
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Figure 5

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Using Rubrics to Review Environmental Education Projects

Pat Barron, Kelly Jacobs and Diane Cantrell

Science & Mathematics Network of Central Ohio (1, 2), Ohio Dept. of Natural Resources (3)

Overview

The Ohio Environmental Education Fund (OEEF), administered by the Ohio Environmental Protection Agency, gives grant awards for innovative projects centering on K-12 environmental education. Between September 1990 and June 1994, 61 projects with a wide variety of audiences and approaches were completed. This paper describes a comprehensive review process to identify projects which were particularly outstanding. The Science and Mathematics Network of Central Ohio (Network) received a grant from the OEEF to design and implement the review process.

The first step in the review was to search for existing criteria for excellent environmental education. After Network staff categorized the various criteria found nationally, a group of leading Ohio environmental educators reviewed, enhanced, and prioritized the criteria by which the projects would be reviewed. Because the projects were diverse, and overall excellence was desired, a holistic approach to the evaluation was chosen. Rubrics were developed for three different types of projects: curriculum, student activities, and professional development.

The actual review process was conducted during a two-day session. A carefully selected group of 16 K-12 educators from around the state used their own experience and the descriptive rubrics to focus their vision of what excellent environmental education would look like in practice. They then reviewed the projects using the rubrics as the standard by which to compare projects. A group consensus activity was used to make final decisions about which projects would be identified as outstanding.

Development of Review Criteria

Starting in August 1994 the Network searched throughout the United States to find examples of criteria or standards being used to review/evaluate existing environmental education programs and projects. The comprehensive search led the Network to two leading examples of environmental education review criteria: The California Department of Education evaluation of environmental education print materials and "The NAAEE Standards Project, Working Papers on the Development of Environmental Education Standards" by Deborah Simmons.

Using standards from these organizations and the OEEF grant guidelines, the Network created a criteria development sub-committee to establish clear criteria necessary for identifying outstanding completed OEEF projects. The group, composed of the following people, was assembled to develop the criteria: Diane Cantrell, Ohio Department of Natural Resources and John Hug, Ohio Department of Education, OEEF Board Members; Rosanne Fortner, Ohio State University, Professor of Natural Resources; Sue Leidigh, Curriculum Director, Wayne County Schools; Kelly Jacobs, Teacher on loan to the Network, Project Assistant; Pat Barron, Science & Mathematics Network, Project Director.

The committee clustered and prioritized the standards and criteria for environmental education programs and materials found nationally. Then, they modified those criteria to reflect the characteristics found in the OEEF Grant Guidelines and created the criteria for outstanding OEEF projects.

The criteria were then translated into review instruments which were rubrics similar to the paragraph rubrics used to assess portfolios. This approach was chosen over others such as scale scoring each criterion, checklists, and scaled rubrics because OEEF completed projects are similar in format to portfolios. Both portfolios and the supporting documentation for completed projects represent compilations of "the best" that the person or project has to offer. The descriptive rubric paragraphs allowed the most holistic review of the OEEF projects.

Different levels of rubric paragraphs were developed by the Network staff. The highest, Level Five, contained the closest match to the criteria developed for outstanding projects. Each criteria within Level Five was then reduced in degree or importance, from Level Four down to Level One. Rubrics were developed for three categories: Curriculum Development, Professional Development, and Student Activity. The three rubric categories were necessary to reflect the diverse nature of the projects.

Review Process

The actual review process was conducted during a two-day session held at a state park lodge. The reviewers were a carefully selected group of exemplary K-12 teachers from around the state. They arrived the night before the review began to get acquainted with the purpose of the review, the projects and documentation, and their fellow reviewers. On the first day of the review, the morning session focused on the how to's of assessing the projects. After a reflection on what constitutes "good education," all reviewers were strategically placed in work teams of 3-4 people in grade level groups.

The rubric paragraphs for all three categories were introduced. Each rubric was heavily laden with educational terms that could be defined in many ways. To build consistent group norms, specific definitions for these familiar phrases were developed through a jigsaw technique by creating "experts" within each work team on certain definitions. For example, the team member responsible for providing the consistent definition to "Inquiry Learning" conferred with other team "experts" expected to define "Inquiry Science". This allowed the definition of "Inquiry Learning" to ripple out into all work teams and they were able to define the term in the same way throughout the process. Other phrases defined using this process included: constructivism, learners participating in the design of the project, interdisciplinary and thematic learning, assessment, multiple intelligences and variety of instructional strategies.

With work teams established and phrase "experts" armed with definitions, teams spent the afternoon reviewing their first group of projects. Each work team had 12-14 projects to review.

After reading through all of the available material, teams then went to the appropriate type of rubric and through group consensus decided which rubric level best described the project. Teams had to remember that they were not comparing projects to each other, but instead were comparing individual projects to a set standard -- the rubric. Also, reviewers were cautioned to not make assumptions about what "might" have happened; their job was to review the project based solely on the documentation. Much discussion occurred among the team members as they scored the projects and completed the required review form. For each project a "Rubric Response Form" was completed that told the rubric type used, the rubric level that matched the project, project strengths and weaknesses, and additional comments. Each project took approximately 1/2 hour to review.

At the end of the day, the project staff met to review the response sheets completed by the teams. After careful consideration, those projects scoring in the lowest two levels were eliminated to allow more quality review time the next day. Projects with a rubric review score of 3, 4, or 5 were saved to be reviewed a second time by a new work team the next day.

The second morning, work teams were reconfigured to allow everyone to work with new people and re-establish group norms for the rubrics. Everyone read different projects from the day before. The previous day's rubric response form was not shown to this day's reviewers so that they could develop their own score without being influenced by the prior review. No individual or team reviewed the same project twice.

This round of project reviews took place all morning. At lunch, the project staff again reviewed the Rubric Response Forms. All projects that scored either a 4 or a 5 from at least one round of reviews were left on the table. All other projects were gathered at the side of the room.

Reviewers returned in the afternoon and were faced with the challenge of finally choosing the "Outstanding OEEF Projects". To accomplish this, work teams were assembled by grade level and went to the grade appropriate projects to review all of the "4" and "5" projects. As an example, all of the elementary teachers reviewed only elementary projects which received a rubric score of four or five. All Rubric Response Forms were displayed at this time. Individuals within each grade level group were then asked to make an individual vote for project(s) he/she considered outstanding by placing a colored sticky dot on a voting card attached to each project. The number of projects each individual could vote for was not limited. After individuals "cast their votes", the group decided together which of the projects were outstanding. Groups chose as many projects as they felt most closely resembled what they considered outstanding. Most groups chose 2-4 projects, but no limit was given. After the conclusion of the session, the project staff completed a final review of projects to check for consistency throughout the ratings and found no inconsistencies.

Conclusions and Recommendations

Based on comments from the reviewers and observations made by the project staff, the review process was very effective. The following conclusions are offered: The background information and shared discussions at the beginning of the two-day session were essential for reviewers to understand the review process and become familiar with the projects. This ensured that the reviewers all approached the process from a common grounding. A balance between structure and holistic review was achieved using the paragraph rubrics. The rubrics were a guide that focused group discussion and set the standards by which to compare the projects.

The Metacognitive Model for Environmental Education Curriculum Development

Margaret B. Bogan

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Introduction

Researchers and practitioners alike are often asked why successful educational programs result in long term audience participation in newly learned teaching practices. A curriculum design emerged from "what participants said" they were experiencing, thinking and learning while studying in and about the out-of-doors, in an Eisenhower funded program in Northeast Alabama. Teacher-participants:

- identified themselves in the teaching process and with the environment.
- bonded with each other and the Earth by making connections between and among disciplines and each other
- transferred their newfound understandings of pedagogy and attitudes with their students

Teachers reported that their lives were changed, personally and professionally as a function of their experiences.

A salad bowl of content and process knowledge from diverse disciplines underlie manifest environmental education curriculum (Bogan 1992). These disciplines include science, technology, social science, political process, organizational dynamics, attitude and pedagogy. Environmental education curriculum design requires the formulation of interconnections among these disciplines. Environmental education curricula shaped and implemented through a bridging world view will be personal, relational, interactive, dynamic, pulsing, content rich, grounded and with purpose (Van Sickle 1992; Bogan & Easton 1993; Noddings 1992).

In order to adequately address environmental education curriculum in classrooms, teachers must examine the window through which they view the world. The diameter of the framework through which teachers view curriculum influences their perspectives. Teachers often choose pedagogical strategies (the implemented curriculum) in direct relation to their teaching world view. Integrated curriculum design and delivery invites the use of varied models of teaching. In order to adequately prepare teachers to deliver environmental education, curriculum designers must provide teachers with a world view that establishes interconnections among disciplines through multiple models of teaching.

Background

The triad of environmental literacy or integration of ecological knowledge with proactive environmental attitude with political activism can be reinforced through pedagogical strategies that accentuate the interconnectedness among disciplines and interdependence among people (Figure 1). Synergistic collaborative interactions promote a deepened understanding of humankind in the environment concomitantly reinforcing the cyclic nature of environmental systems. Metacognitive processes and reflective thought embedded in the manifest curriculum, implemented curriculum (pedagogy) and curriculum assessment strategies serve to reinforce the notions of interdependence in the biophysical

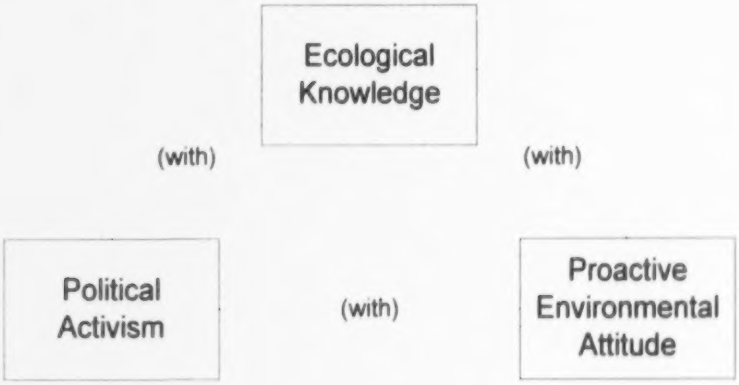

Figure 1 - Triad of environmental literacy

world and human political world. Environmental education curriculum based on the triad of environmental literacy will hopefully engender humankind to create themselves environmentally literate individuals who:

- command cognitive and affective knowledge about their biological and physical surroundings (ecological),
- possess political know-how and
- display a willingness to engage in responsible environmental behaviors.

Presenting the learner with options to become environmentally literate will enable the learner to experience a world view of humankind in relation with the Earth.

Environmental Education Curriculum Design

Development of an interactive curriculum is just the beginning of staff development. Fostering a learning environment and delivering curriculum in a supportive, innovative way can help to create an atmosphere that generates an understanding of the interrelationships and interdependence among disciplines, self and each other. The notions inherent in environmental education provide the curriculum designer with fertile ground to select interactive pedagogical techniques that:

- nurture learner growth,
- enhance cross disciplinary understanding/tolerance and
- stimulate the invention of a new ways to facilitate the emergence of the connections and bridges learners can use to make sense of the world.

The notions inherent in environmental education also provide the learner with the potential to increase self-confidence through understanding multidisciplinary/interdisciplinary content and process through bridging. These intra and inter content bridges become the foundation for further growth.

Research Techniques and Data Sources

Teachers develop environmental literacy in the same way they truly come to comprehend anything: through experience (Dewey 1938; Van Sickle, Dickman, & Bogan 1995). Teachers must reflect on and analyze the parts of environmental education curricula they have experienced. A multiple case study was considered most appropriate for this study (Bogdan & Bicklen 1982). Data were collected and analyzed from several sources. These data sources were reflective journals, questions, "Today I learned" statements and course artifacts. These data reflected an emergent curriculum design of personal and group processes housed in active learning, teaching styles.

Results - The Metacognitive Model For Environmental Education

For purposes of this study, environmental education curriculum design can be viewed as having four major components. The pedagogy of interconnectedness engulfs personal practice, disciplinary process and group process. The pedagogy of interconnectedness is the glue that connects personal practice, group process and disciplinary perspective.

Personal practice, group process and disciplinary perspective, couched in a pedagogy of interconnectedness constitute the curriculum model. The personal practice segment asks learners to focus on knowing self--to inquire who they are, why they do the things in the manner(s) chosen and how they come to know the world. Once learners begin to identify the who, why and how of their being, they create a lens through which to view themselves and the world. This leads to reflective practice.

Reflective practice is the process of recalling past events which serve to stimulate opportunities for learners to consider experiences with the intention of modifying performance (Cruickshank & Applegate 1981). Reflective practice establishes a framework from which to grow by scrutinizing the ethical and moral platforms of past performance (Van Manen 1977; Fitzgerald 1993). Through the process of reflection, recent past events are recorded. Significant episodes are recounted because they bothered or excited the writer or caused the writer to think or learn. Often word-for-word reconstructions of past dialogues are scripted. At the level of scrutiny, reflection delves into metacognition.

Metacognitive practice empowers the learner to understand ways of knowing. Metacognition cultivates an awareness of one's thinking processes and products which leads to self-management and growth (Flavell 1976). Metacognitive practice initiates a complexity of simultaneous internal and external discourse that provides a vital component about how what one has done can be used to transfer learning (Fitzgerald 1993). Metacognitive practice permits the development of relationships between self, content and pedagogy. The metacognitive learner potentiates or catalyses group synergy.

Group focus refers to the process where teams of four to five teachers connect themselves to each other. They build bridges between each other, initially based on why they are where they are. In group focus, teachers storm, norm and form a working cadre, each individual to become interdependent with each other group member.

To attain group rapport, intellectual, emotional and spiritual processing must be shared among group members. When the results of reflection and metacognition are communicated among group members, the group is able to develop consensus on issues, how to's, where to's, if's and why to's. The consensus process permits group members to break individual communication barriers and become truly interdependent.

Groups develop in-jokes and vocalize heartfelt concern for each others' personal well-being. At this time, group identity solidifies (Bogan & Easton, 1993; Bogan & Easton, 1994).

A group establishes its desired learning potential based on its common or shared system of values and knowledge. This desire to grow, group inquiring. Group inquiring is the active practice of becoming more informed.

The disciplinary perspective circle includes natural science, social science and world view. This circle includes subject specific content and process information with areas of content overlap, ethical and social values. The world view segment of this circle is often developed through the values clarification process. Through values clarification, intra and interdisciplinary bridges are created by the student that make the relationships among disciplines part of the students way of knowing.

The outermost circle is entitled, the pedagogy of interconnectedness. A pedagogy of interconnectedness refers to interactive models of teaching, timing of delivery of content and process, and assessment as interwoven parts of the manifest curriculum. A pedagogy of interconnectedness includes is curriculum implementation matched with curriculum assessment strategies, each related to the other. In this environmental education curriculum, instructional design includes pedagogical and assessment strategies that reinforce content knowledge.

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"Windows on the Wild" -- Materials for Teaching Biodiversity

Judy Braus and Margaret Pennock
World Wildlife Fund

The loss of biodiversity has been identified by experts as one of the most critical environmental problems facing the world. Yet most people in this country are unaware of the problem, and both teachers and educators who work at zoos, aquariums, museums, nature centers, and other nonformal educational institutions identify a lack of training and materials on this subject as the key reasons they do not address this issue in their teaching and workshop programs. World Wildlife Fund (WWF) is developing, implementing, and evaluating a national environmental education program called "Windows on the Wild" to provide educators with the materials and training they need to carry out effective biodiversity education programs. Initially, "Windows" is targeting middle school students and educators.

"Windows on the Wild" uses biodiversity as the organizing theme to help increase environmental literacy of middle school students, strengthen the links between formal and nonformal educators, and enhance biodiversity training for educators at formal and nonformal institutions. As part of the program, WWF is developing supplemental curriculum materials for students and educators. It is also developing and implementing training materials and educator workshops designed to increase knowledge of biodiversity issues, help educators develop the skills and commitment to incorporate environmental education into current teaching strategies, and train trainers to develop biodiversity environmental education programs.

"Windows on the Wild" Materials

In response to educators' need for supplemental curriculum materials on biodiversity, WWF is in the process of developing a series of interdisciplinary modules on the following topics: Biodiversity Basics (an introduction to biodiversity); Healthy, Sustainable (Human) Communities; Wildlife Trade; Fisheries and Sustainability; Human Consumption and Over-Consumption. Each module aims to enhance environmental awareness and knowledge as well as critical-thinking and problem-solving skills.

Each module will contain background information and resource information for educators and 5-10 classroom or field activities. To stress involvement in the local community and to make the issues relevant to students' lives, each module will include a community investigation. In addition, each module will contain case studies that use current data, examples, or research to illustrate important concepts and to engage students in analyzing and evaluating information.

The modules are currently in draft form and will be classroom tested in the 1995-96 school year before being produced. WWF also plans to develop modules on economics and biodiversity, global change, and conservation biology.

In 1994, WWF produced *WOW! A Biodiversity Primer*. Written for middle school students, *WOW!* is in full-color and magazine-style. It includes fiction and non-fiction stories, comics, interviews, and a variety of other writing styles that provide an engaging overview of biodiversity for students. The primer has an accompanying educator's guide. In 1995, WWF produced the *Web of Life Educator's Guide*, which is designed to accompany WQED's two-hour biodiversity special – *The Web of Life*. These materials are available through World Wildlife Fund.

Habitats for Learning: A New Look at School Land Labs

Diane C. Cantrell

Ohio Department of Natural Resources, Division of Soil & Water Conservation

Overview

Habitats for Learning encourages the use and development of outdoor classrooms, or land labs. The main point of this program is that every school has outdoor sites – parking lot, field, playground – ready to use right now for teaching and learning.

The Habitats for Learning program was developed by six statewide agencies and organizations to promote learning outdoors. The materials include: 1) a motivational **video** that presents the underlying "Habitats" premise that use of the existing site should precede development; 2) a nuts and bolts **planning guide** with sections on educational benefits, ways to use the existing site, building a support system, developing and implementing a plan, site development, and planning aids; and 3) a **directory** of existing land labs in Ohio.

A New Look at School Land Labs

The program takes a new look at using and developing school grounds as a habitat for learning. These areas are also called outdoor classrooms, outdoor learning sites, and school land laboratories or "land labs," but the new term reflects a broader notion of the potential of these areas.

A "habitat" is a place where plants or animals naturally live and grow. Habitats for learning are places where people naturally learn and grow. They are as diverse as habitats for living, ranging from acres of wilderness to a single school sidewalk. Where some people might see a barren school site with nothing but bricks and concrete, others find a fertile area filled with habitats for learning. Blacktop surfaces, cracks in sidewalks, flagpoles, fences, playgrounds, sides of buildings, and other common school ground features all offer a wealth of learning opportunities. Additional attributes, either natural or human built, only add to these possibilities.

Benefits of Habitats for Learning

Outdoor habitats can be powerful vehicles to achieve educational goals. They naturally motivate young people to learn, building on what Rachel Carson called the "sense of wonder." It places learning in a meaningful context, helping learners more easily integrate new knowledge and skills into a larger framework.

Outdoor habitats for learning can support curricular objectives in all program areas, including science, mathematics, social studies, language arts, foreign language, arts, health, physical education and others. The trick is to make sure that outdoor learning is based on the existing curriculum. It should not be an "extra" or add-on.

More importantly, habitats for learning support innovations in education. They are an ideal arena for cooperative learning, hands-on activities and problem solving. They offer a natural way to support integrated approaches to learning and thematic organizations of the curriculum. The interdisciplinary nature of the environment – both natural and manufactured – provides ways for educators to put these and other strategies into action.

Learning objectives in the areas of knowledge, skills and attitude spring to life in the outdoors as learners participate in hands-on, concrete experiences. By making real-life connections, learners apply lessons in meaningful, relevant ways. Even the most reluctant learners respond to these opportunities.

Outdoor habitats for learning can augment all areas of the curriculum, but they are especially ideal for learning about the environment. They provide first-hand experiences in the out-of-doors, so learners gain an appreciation for the environment, an understanding of environmental issues, and additional insight of their role within the environment.

In addition, habitats for learning are an incredible resource because they exist right outside the school door. They provide ongoing "field trip"-type experiences without the expense and logistics usually associated with these activities. The outside environment is an integral part of the school environment and can be used daily for teaching and learning.

A Three-Step Process: Use, Enhance and Develop

The term "school land lab" usually conjures up images of natural areas, large or small, modified in some way to provide outdoor learning experiences. Trails, signs, study stations, plantings and other improvements often come to mind. Schools and communities frequently ask specialists in natural resources, history, aesthetics and the arts to help with this kind of development.

However, such resource specialists commonly express concern about sustaining interest in such elaborate developments. While they can relate wonderful success stories, they also can usually recall as many or more efforts that floundered and fell into disuse. All too often, an outdoor habitat for learning is the pet project of one or two motivated teachers and their students, but their enthusiasm may never fire up the rest of the school. If they leave the district, it is likely that the habitat for learning will fall into disuse and disrepair.

The Habitats for Learning program has been designed to ensure long-term use of the site by using a step-by-step process involving many elements. However, the philosophical cornerstone for the project is simple:

Use of the existing site should precede enhancement and long-term development.

This underlying premise implies a three-phase approach:

USE – Teachers and learners use, or continue to use, the existing site to meet educational objectives.

ENHANCE – Based on actual use of the habitat for learning, teachers, learners and others make site improvements as needs arise, (e.g., attend to poison ivy, pick up litter, mulch muddy areas, hang a bird feeder).

DEVELOP – While using the "enhanced" existing site, a broad-based committee designs and implements a long-range plan that matches site development with the curriculum. This plan should capitalize on existing features and attributes that have been discovered in large part through use of the site. It should also identify needs for further development.

Why does Habitats for Learning promote this three-phase approach? First, existing school sites have tremendous educational value. They are untapped, free resources going to waste as educators wait for time and money to "build a land lab." Second, regular use of the existing site as a habitat for learning will uphold high-quality and long-term use of the developed site by building broad-based interest and support. The ongoing use of the school grounds from the beginning allows teachers and learners to experience success and continually identify new learning opportunities. In this way, teaching and learning in the outdoors will become an integral part of the educational process, as natural as using the blackboard or the library.

Program Development and Planning Aids

The implications of this philosophy are significant. The concept of land lab development is expanded to program development, which includes both educational **and** site planning. Following the architectural premise of "form follows function," educational program development should precede site development. Traditionally, school personnel or resource specialists inventory the existing site and then decide, with minimal consideration of the curriculum, what to develop and how.

A more successful approach involves an interplay between these two elements to make sure both curricular goals and site potential are fully achieved. While not necessarily a linear process, the educational purposes – not the features of the site – should drive the planning and development process.

Figure 1 provides an example of a planning aid that demonstrates this critical interplay. The lower case letters illustrate how a fifth grade teacher currently uses the "trees, parking lot, playground and fence" on the school grounds to teach three different integrated units (trees, water quality, cycles) as well as subjects such as math, language arts and art. The upper case letters show additional possibilities. Then, when someone says, based upon this use, that a learning activity would be even richer "if only we had __," planners know that an important new site feature (e.g., more trees, a pond) to include in the development plan has been identified and will be used.

For More Information

Habitats for Learning was developed by the Ohio Department of Natural Resources and funded by the Ohio Environmental Education Fund. Copies are available by writing: OEEF, Ohio Environmental Protection Agency, 1600 WaterMark Drive, Columbus, OH 43216.

Figure 1
INSTRUCTIONAL/SITE INVENTORY
Current and Potential Use of Existing Site

Grade Level(s) 5th

Curricular Approach	Existing Site Features			
	Trees	Parking Lot	Playground	Fence
Integrated Topic: Trees	• adopt-a-tree • tree cookies	• graph the actual heights of different trees	• draw map of existing trees	• compare school fence to wood/other fence
Integrated Issue: Water Quality	• PLANT TREES • investigate how shade effects water temperature	• investigate drainage pattern after rain • test water quality of run-off	• investigate erosion patterns • investigate sources of pollution	none
Integrated Theme: Cycles	• observe and record yearly changes	• USE SHADOWS TO INVESTIGATE CYCLE OF SUN	• bury trash to study decomposition and nutrient cycle	• OBSERVE GROWTH CYCLE OF PLANTS ALONG FENCE OR ON IT
Subject: Math	• estimate height • ESTIMATE BOARD FEET	• MEASURE SIZE OF AN ACRE • GRAPH TYPES OF CARS	• estimate numbers of plants • graph data from hula hoop study	• design 3 different ways to calculate the length of fence and compare results
Subject: Language Arts	• read Giving Tree • write own Giving Tree story	• listen to song "big yellow taxi" and discuss	• read environmental stories • write poems • role play things from nature	• read poem about fence • RECORD OBSERVATIONS ABOUT LIFE ON OR NEAR FENCE
Subject: Art	• draw pictures in adopt-a-tree journal • bark rubbings	• Paint A MAP OF THE U.S. OR WORLD	• use natural items to make a collage • make dyes from plants	• study and draw shadows

Wayfinding: The Route to Environmental Competency

Cynthia Carlisle and Robert D. Bixler
Cleveland MetroParks

Introduction

In an urbanized North America, childhood offers few opportunities to explore unfamiliar and wild areas. Daily experiences that formerly resulted in the implicit learning of basic outdoor skills are rarely available today. One of the many necessary but poorly developed skills is the ability to wayfind in unstructured environments. Anxiety about not being able to find one's way into and out of wildland areas limits the acquisition of environmental knowledge and the appeal of a wide range of activities that reinforce the value of wild areas to the quality of human life. Recreational choices and even career preferences may be limited by fear of getting lost and lack of wayfinding skills.

Success of environmental education programs can be measured by whether the participants later demonstrate an interest in returning to the out-of-doors on their own initiative. No matter how important or interesting the wildland activity, individuals are unlikely to return if they believe they cannot find their way in and out of an area. Not only are wayfinding competencies pivotal in a decision to explore an outdoor environment, they are also critical to being able to enjoy the experience. Navigating through a strange environment for the first time requires that an inordinate amount of attention be given to wayfinding. A first trip into an area is likely to be anxiety-laden, involving many wayfinding decisions. In contrast, when wayfinding abilities are well-developed, the attention directed to wayfinding is peripheral to other aspects of a trip.

The need to emphasize wayfinding skills in environmental education programs has been documented in research projects dealing with fears related to wildland environments. One study asked environmental educators working with urban school children to list common fear responses they had observed among students. Fear of being lost in the woods was reported by 56 percent of the educators and ranked fourth in frequency out of 23 categories (Bixler, Carlisle, Hammitt and Floyd 1994). In another study, 1,337 middle and high school students in three southeastern states rated their expectation of encountering feared objects or situations during a hypothetical day trip into a large forested area. Of the 20 researcher-defined items, fear of getting lost in the woods was ranked second only to fear of stepping on a snake (Bixler, Floyd and Hammitt 1995). These two studies provide some evidence that fear of getting lost in the woods is widespread and may limit interest in all activities requiring self-navigation through wildland areas.

An understanding of the decision processes involved in wayfinding and how people form mental images of environments has practical implications for outdoor and environmental education. Developing visitor information services for clarity and teaching wayfinding skills as part of field interpretation can help build confidence in the reluctant visitor. With well-developed wayfinding skills, wildland environments are more likely to be appealing to non-traditional populations.

Strategies for Improving Wayfinding Competencies

Wayfinding tools intended to direct visitors through a wildland area must lower anxiety about leaving the comfortable exhibit building, instill confidence in one's ability to successfully negotiate a route, and increase motivation to enter the area. Park maps and verbal instruction from educators or park staff should increase visitors' expectations of a positive experience while lowering the effort required to explore an area.

Programming

Individuals with well-developed wayfinding skills perform the process of wayfinding almost unconsciously. These skills were learned implicitly in childhood and to a lesser degree as adults through repeated self-directed exploration. For individuals with few wildland experiences, the processes of wayfinding can be modeled during field programs and practiced along the trail. Incorporating wayfinding instruction into programming for school groups is particularly important because these groups may contain many non-users of wildland areas.

When working with groups of inexperienced visitors the on-site educator should assume that visitors know little about park wayfinding systems. Even students who possess general knowledge of maps and have practiced working with them in school have usually had little experience using maps outside the classroom (Muir 1985). Visitors should be informed that map boards of wildland parks are often installed at trailheads, close to information centers, adjacent to restrooms, or in parking lots. To begin an orientation session, groups should start at a properly installed map board. The instructor should point out the map legend and how it can be used to determine the availability of trails, their average length and how trails are marked. Two types of trails, the loop trail which requires little knowledge of actual position in the environment and route trips, which require making decisions at intersections, should be contrasted.

Every chance should be given for the participants to practice making wayfinding decisions. Before departing and at landmarks along the trail, they should be able to orient the trail map to the environment, locate themselves on the map and trace their route to the destination. While confirming location and alleviating fear, this skill involves identifying landmarks and nodes (trail intersections) in the environment and finding representations of them on the trail map. Distinctive, unambiguous and reliable landmarks should be identified, with particular aid directed to young children and novice visitors unfamiliar with wildland environments. Research has compared adults, fifth graders and second graders on their ability to choose functional landmarks in an urban setting (Allen, Siegel and Herman 1979). Illustrating the importance of experience in wayfinding, younger children tended to choose landmarks that were novel to them but not easily distinguishable from similar examples further along the route, while adult college students demonstrated the ability to choose unambiguous reference points where turns had to be made.

The literature on wayfinding suggests that competent wayfinders practice several simple behaviors to accompany the basic skills of decision-making and map reading (Cornell, Heth and Broda 1989; Cornell, Heth and Rowat 1992). When navigating, they look back occasionally, choose unambiguous and permanent landmarks, and plan return strategies at route intersections. The educator can rehearse these behaviors with groups while on a trail.

Map Boards and Trail Maps

Easy accessibility to reliable written information is important since instruction is not always possible. Map boards and other wayfinding aids should be visible and accessible at trailheads, the park office, exhibit buildings, or close to bathrooms. Map boards should be accurate, simple (i.e. not too detailed), and aligned with the environment they represent. Trail maps and map boards should identify each trail, what will be observed along the way and upon reaching a destination, the length and average time to complete it, the difficulty of the terrain, and any hazards. Clarity of presentation encourages visitors to explore further, while any perception that maps or other aids are less than accurate will likely heighten anxiety, discouraging hesitant visitors.

Possibly the most important part of building confidence in a novice is the ability to locate one's position on a map board and see a correspondence between the map and the immediate environment. A "You Are Here" marker on the map is essential and trailheads should be visible from the map board along with one or more landmarks. The obvious relationship between the correctly aligned park map (i.e. top of the map is aligned with the terrain in front of the map, left to left and right to right) and the environment informs the visitor that the map accurately and functionally represents the area. The map and terrain must confirm each other with the preconceived image of the area developed from the map actually matching what is being perceived (Ottoson 1987).

In developing wayfinding tools, it is important to remember that the people most dependent on them are least like the professionals who design them. The usefulness of maps can be enhanced by using sound cartographic principles and formative evaluation, while the ultimate test of map reliability is whether first time visitors can efficiently use the maps to select and navigate a trip through a natural area.

Conclusion

Recent research has documented that fear of getting lost is a major barrier to individuals participating in wildland-dependent activities. As North America becomes increasingly urbanized, fewer people are likely to have basic outdoor skills through what were routine childhood experiences in wildland areas. Fundamental skills leading to a sense of comfort and security in the out-of-doors must accompany attempts to develop environmental knowledge, competency and change in behavior. The lack of wayfinding skills may be a major variable influencing whether students accomplish the environmental learning objectives and then try wildland-dependent activities on their own. If environmental educators expect program participants to develop an interest in the environment, developing wayfinding competencies in their inexperienced visitors must become a priority. Wayfinding strategies must be explicitly taught, supported by well-designed wayfinding tools including map boards, signs and trail maps. Wayfinding skills provide a route to environmental competency by allowing students to focus on learning about the environment rather than worrying about getting lost.

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A Summary of the Status and Needs of Environmental Education in Wisconsin K-12 Schools

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Introduction

Over the past four years, the Wisconsin Center for Environmental Education (WCEE) has been actively involved in collecting data on the environmental education literacy and needs of the state's students, teachers, and school administrators. With support from the Wisconsin Environmental Education Board (WEEB) and the Wisconsin Department of Public Instruction, staff of the WCEE have developed, piloted, and conducted a statewide assessment of over 3,500 fifth grade and high school students' environmental literacy. A random sample of over 900 Wisconsin teachers was surveyed to determine their perceived competencies and needs related to teaching environmental education. Most recently, a survey of more than 1,000 Wisconsin school administrators (i.e. all the state's principals and curriculum coordinators) was conducted to gain a perspective on what they feel are the most pressing needs for environmental education in Wisconsin public schools. Given Wisconsin's legislative mandates requiring schools to have environmental education (EE) curriculums and requiring preservice teacher education in EE, all the results of these projects taken together provide an important and much needed profile of the current status of and needs for environmental education in Wisconsin.

A comprehensive assessment of any state's students', teachers', and school administrators' knowledge about, attitudes toward, and behavior related to the environment or environmental education has, to our knowledge, never been done before. We hope the experiences and findings related to Wisconsin's effort will be of some assistance to other states, provinces, or school districts. A comprehensive report which includes the findings, conclusions, and recommendations from the assessments is currently under development by staff of the WCEE. Following is a partial summary of elements of that report.

Wisconsin's Student Environmental Literacy Assessment

What do students know, think and do about environmental problems and issues? How do we know if our EE programs and efforts are working? In order to gain insight into these questions in Wisconsin, an environmental literacy assessment of over 3,500 fifth grade and high school students was conducted in 1994 by the Wisconsin Center for Environmental Education. Students were questioned about their perceived attitudes, locus of control, assumption of responsibility, and frequency of behaviors relative to the environment as well as on their knowledge of basic ecological principles and environmental issues.

Development of the student environmental literacy assessment instruments involved an extensive three year research, writing, review, and item analysis process (Peri, 1995; Quale, 1993). As a result of the development stage of the project, fifth and eleventh grade instruments were developed to assess four components of environmental literacy (Iozzi, Laveault, and Marcinkowski, 1990). These four areas are briefly outlined below:

I. Affective learning outcomes
    A. environmental sensitivity

- B. values related to prevention and remediation of environmental problems and issues
- II. Predictors of environmentally responsible behavior
    - A. locus of control
    - B. assumption of personal responsibility
- III. Environmentally responsible behaviors
- IV. Cognitive learning outcomes
    - A. knowledge of ecological foundations
    - B. knowledge of environmental problems and issues
    - C. knowledge of environmental issue investigation and action strategies

The environmental literacy assessment instruments developed around this framework were administered to 1,867 students at the fifth grade level and 1,802 at the high school level during the spring of 1994. Results of the environmental literacy assessments indicate that students at both grade levels have positive attitudes towards the environment, are concerned about environmental problems, and believe that they can and should take action relative to those problems. However, results in both the behavioral and cognitive areas were somewhat less encouraging.

The following table indicates mean subscale percent scores (percent of maximum possible) for each grade level. Three populations are included in each grade level: the total population (TP), an identified 'environmentally literate' group (EL), and a 'not identified' group (NI). Note that comparisons of the two subpopulations show a significant difference in scores which provides an indication of the tests' construct validity and ability to discriminate between students relative to environmental literacy.

For the attitude and predictors of behavior items, students were asked to respond to statements using a five choice Likert scale (strongly agree to strongly disagree). Behaviors were assessed by asking students to report frequencies of various actions, again using a Likert-type scale. The cognitive items were constructed as multiple choice, 'best answer' questions. Specific examples of some of the item responses in each of the four subscale areas are revealing.

Both groups of students agreed that environmental education is important. For instance, fifth grade students felt that their school should have more lessons about the environment (54%). Similarly, high school students said that knowing about environmental problems and issues is important to them (67%). However, it is interesting to note that while fifth grade students identified school as the thing that has contributed most to their understanding of the environment (29%), high school students said that television was the main contributor to their understanding (34%). Perhaps the most surprising finding was that only nine percent of the 'environmentally literate' high school students identified school as their most important source of information, ranking it lowest among the five choices provided.

Table 1: 1994 Wisconsin Student Environmental Literacy Assessment: Mean Percent Scores

	Subscale/Grade Level/Mean % Scores							
	Attitude		Predictors		Behavior		Cognitive	
Grade Level: Population:	5th	11th	5th	11th	5th	11th	5th	11th
Total Population (TP) N = 1867 (5th) N = 1802 (11th)	65	69	67	64	51	41	59	54
Teacher & Self Id'd (EL) n = 140 (5th) n = 128 (11th)	73	76	76	69	59	48	74	69
Not Id'd by Either (NI) n = 1188 (5th) n = 1133 (11th)	64	67	65	61	49	39	55	51

Students were aware of and concerned about a variety of environmental problems. High school students reported being concerned about deforestation (71%), waste production (76%), environmental health hazards (87%) and species extinction (79%) among other things. Fifth grade students agreed that the government should encourage people to have energy efficient cars (63%) and that it was not okay for a little water to get polluted because there is plenty of water (79%).

Both groups of student also indicated a fairly strong sense of their ability and responsibility to take positive action relative to environmental problems. Eighty percent of the fifth grade students said that they disagreed that it is a waste of time to work to solve environmental problems and sixty two percent felt that things they do have an effect on the quality of the environment. High school students disagreed with the statement that there was not much they could do that will help solve environmental problems (64%), agreed that they can contribute to the solution of environmental issues by their actions (69%), and felt it was their responsibility to help solve environmental problems (53%). Students at the fifth grade level said they were willing change their habits to help solve pollution problems (71%) and even that they would be willing to watch less TV in order to save energy (47%).

Fifth grade students in general reported taking environmentally related actions more frequently than did high school students, although both groups scored low on this section (see table 1). Students at both grade levels reported that they almost always or often take direct actions (ecomanagement) such as turning off lights (66% of high school, 71% of fifth grade students) and recycling (72% of high school and fifth grade students). Economic actions were not often taken by either group. Students also reported taking persuasive actions less regularly, for example, asking someone to buy recycled paper (19%, fifth grade), talking to someone about an activity that is harmful to the environment (25%, high school), or asking people to do things that are good for the environment (34%, fifth grade). High school students said they never or almost never send letters to the newspaper about environmental issues (90%). The areas in which students least frequently took action were the political and legal action categories, which is perhaps understandable for school age children. However, it could also indicate that students are not learning a variety of action skills in school.

Many of the knowledge questions revealed some interesting results. The fifth grade students seemed to know basic ecological terms (food chain, 93%, competition, 72%) but were weak in their understanding of energy and energy transfer. Thirty-six percent of the fifth grade students said that the original source of energy for (almost) all living things is water! Only fifty percent chose 'the sun' as the best answer. Similarly, high school students do not seem to have a good understanding of ecological principles. Although they also seem to know basic terms (adaptation, 70%), competition (65%) and habitat (76%), their understanding of systems, systems interactions and energy transfers was disheartening. It was surprising to learn that such concepts as carrying capacity (32%) and biomagnification (43%) were unfamiliar to the high school students.

Students had difficulty with quite a few of the questions dealing with knowledge of environmental problems and issues. Only forty four percent of the high school students knew that the main cause of loss of biodiversity today is habitat alteration by humans and forty four percent did not know that heat is considered to be a major water pollutant. Fifth grade students scored slightly higher on the cognitive questions than high school students. However, they again appear to be less knowledgeable about energy related issues.

To summarize, results from this assessment seem to indicate that, relative to environmental literacy, both fifth grade and high school students demonstrate positive attitudes and predictors of behavior. However, the students' actual behaviors are limited and their knowledge is marginal. Given the positive attitudes of the students, there is certainly room to hope that if students are provided with quality environmental education instruction and programs, there will be improvement shown in future assessments.

Teachers' Perceived Competencies in, Attitudes Toward, & Time Spent Teaching EE

In the Spring of 1992, over 1,500 Wisconsin teachers were randomly surveyed regarding their perceived competencies in, attitudes toward, and time spent teaching environmental education (Lane, 1992). The survey instrument was returned by 915 teachers (59%).

Of the teachers who returned the survey, about 30 percent reported they did not teach about the environment. The primary reason they did not teach about the environment was that they perceived the concepts were unrelated to their area (25.8%). The second most frequent response was that they did not have the background (24.2%). Lack of class time (14.0%) was the third most frequent response. When asked what would most influence them to include the environment in their instruction, 32.5 percent responded "more inservice classes in EE." Better access to resources (25.5%) was the second most frequent response

About 70 percent of the respondents reported they did teach about the environment. Overall, they perceived themselves as moderately competent in teaching about the environment. On a five point Likert-type scale, the grand mean for all cognitive, affective, and behavioral items was 3.59.

With regard to using cognitive teaching methods, teachers perceived that they were competent (X = 3.84). When given a list of 18 cognitive teaching methods, the largest percentage of teachers (24.3) said they were effective in using six to eight of them. An additional 20.3 percent said they were competent in using nine to eleven of them, and 18.5 percent said they were competent in using three to five of the methods listed.

Teachers strongly agreed that students should be guided in developing values and feelings of concern for the environment (X=4.48). However, teachers only felt moderately competent (X=3.62) in using affective education methods. When given a list of seven affective education methods, the largest percentage of teachers (19.5%) said they effectively used two of them. Three affective education methods were reported as being used effectively by 18.4 percent of the teachers, and four methods by 18.2 percent. Sensory awareness and action learning were the two affective methods teachers most often used.

Teachers agreed that they should provide students with actual experience in resolving environmental issues (X=4.14). However, teachers were undecided or unsure whether they were meeting this objective (X=3.18). When asked how many action strategies they effectively used, the largest percentage of teachers (34.8%) said zero (0). The next most frequent response was one (1), by 24.3 percent of the teachers. Two methods were effectively used by an additional 23.4 percent of the teachers. The two action strategies by far most frequently taught by teachers were ecomanagement ($\underline{n}$=271) and persuasion ($\underline{n}$=238).

Teachers' attitudes were generally very positive toward the environment (overall X = 4.15). One illustrative attitude is that teachers disagreed that the main reason they teach about the environment is because it's mandated.

About 75 percent of the respondents reported teaching about the environment less than one half hour per subject per week. A multiple regression analysis, using teaching time as the dependent variable, indicated that multiple EE inservice courses was the best predictor of teaching time, accounting for 24 percent of the variance. The second best predictor was the teachers' reference to their EE curriculum plan accounting for an additional eight percent of the variance.

Assessment of School Administrators' Knowledge, Attitudes and Support for EE

The purpose of this research project was to assess school administrators' knowledge of, attitudes toward and degree of support for environmental education in Wisconsin public schools. A survey instrument was developed with the assistance of a project advisory committee consisting of professional educators, principals, superintendents, directors of curriculum and university faculty. The project was sponsored by the Wisconsin Center for Environmental Education and endorsed by the Wisconsin Department of Public Instruction, the Association of Wisconsin School Administrators and the Wisconsin Association for Supervision and Curriculum Development.

A survey was mailed to 1818 Wisconsin public school principals and 308 directors of curriculum in February of 1994. Over fifty percent of the principals (N=914/50.3%) and 67.9 percent of the directors of curriculum (N=209) returned their surveys.

Results revealed that over 70 percent of the administrators have had at least 1 course in environmental education, although only a third reported having attended more than 2. Over 85 percent of both principals and directors of curriculum strongly agreed with the goals for EE, and

95 percent agreed that EE should be infused into the existing curriculum. Only 59 percent of the principals and 78 percent of the directors of curriculum reported that their district had a written curriculum plan for EE, despite a 1985 state mandate requiring all school districts to have a plan by 1990. Over half reported their school or district did not have someone identified as the EE coordinator, specialist or chairperson and of those that did, more than 50 percent described the position as voluntary with no release time.

Most school administrators reported they distribute EE information (70%), offer encouragement to teachers teaching about the environment (75%) and support teacher requests to attend EE workshops not sponsored by the district (75%). However, only 10 percent of the principals and 33 percent of the directors of curriculum reported they write grants for EE to a considerable or great extent. Principals with 3 or more courses in EE reported taking a higher degree of action to support EE than principals who have not attended any EE courses.

According to administrators, the top ranked barriers to EE in their schools or districts were lack of funding, lack of time and lack of support from teachers. Over half indicated they did not have the time to promote EE and between 40 and 50 percent of both principals and directors of curriculum felt their was not enough class time. The top three needs identified by school administrators were more time (63%), more funding (52%) and more inservice workshops for teachers on EE (39%).

Some school administrators were very proud of their school or district's accomplishments in EE and no doubt some districts are doing a fine job meeting the goals of EE. For a majority of schools, however, the lack of strong financial support for EE, the concern for a lack of time in the school curriculum, the volunteer status of most EE coordinators and the small amount of time spent on EE per week are all telling indicators that EE is not receiving the same attention as more traditional subjects in Wisconsin public schools.

If Wisconsin is committed to promoting the environmental education of its citizens, then state agencies, professional education associations, environmental educators and academic institutions need to increase their efforts to provide incentives, funds, effective training and personnel support for EE so that it becomes a higher priority in Wisconsin public schools.

Comprehensive Findings and Statewide Implications

I. Importance of Environmental Education

Students believe that learning about the environment and associated issues is relatively important, and they are sincerely interested in receiving K-12 classroom instruction in this area. Further, teachers and administrators overwhelmingly agree that education about the environment should be a priority in K-12 instruction even if it must be implemented through legislative mandates.

Implications: There is significant support to include environmental education as a part of the institutional processes and disciplines that presently comprise K-12 education in Wisconsin. Historically, environmental education (EE) has been treated as a supplemental or peripheral discipline. A more contemporary view held by students and teachers would seem to place it in line with the core goals of our state's education system.

Schools should evaluate their approach to environmental education. Institutional planning should provide the area of environmental education with support, time, and other resources that are allotted to other subjects or educational processes that are considered priorities.

Teachers and administrators believe and expect that environmental education will be a part of Wisconsin's preservice and inservice teacher education programs in Wisconsin.

Implications: The state of Wisconsin, through its teacher education institutions, should accommodate the expectation of preservice training in environmental education by ensuring that university preservice programs offer appropriate environmental education course work.

Inservice programs in environmental education should be made available to educators around the state. Also, appropriate incentives should be offered to teachers who elect to pursue these inservice opportunities. Inservices should involve opportunities for teachers from a variety of disciplines (subject areas) and levels (K-12). Also, inservices should range from introductory EE instruction to advanced leadership opportunities in EE.

II. What Constitutes Environmental Education in Wisconsin K-12 Schools

Teachers and administrators in Wisconsin agree that all students should experience environmental education as it relates to appropriate awareness/knowledge, attitudes/values, and behaviors/actions-skills. Further, they believe schools should have K-12 scope and sequence plans for education about the environment.

Implications: Schools planning on implementing environmental education programs should have appropriate scope and sequence objectives (i.e., subject area and grade level objectives) that address identified awareness/knowledge concepts, attitude/value concepts, and behavior/action-skill concepts.

Schools should evaluate the effectiveness of their environmental education efforts by assessing the degree to which students are achieving the expected awareness/knowledge, attitude/value, and behavior/action skill concepts.

III. Status of Wisconsin Student Achievement in Environmental Education

Ecological knowledge and awareness of environmental issues in the average Wisconsin student is lacking relative to expected educational standards. Higher standards are achievable and desirable.

Implications: It is widely agreed that environmental issues will ultimately be prevented or remedied as a result of the general citizenry pursuing ecologically sound actions or behaviors. Presently, Wisconsin students have limited awareness of existing environmental issues. Further, they are lacking in the ecological knowledge base that would be appropriate to analyzing or understanding the multifaceted nature of environmental concerns. As these students graduate from high school, it seems justifiable to suggest that, as a population, they will be cognitively ill prepared to deal with the many environmental concerns that plague both the health and economy of this state.

Results of this assessment indicate that students can achieve higher standards as exemplified by the significantly higher scores of students who were self identified and identified by teachers as being environmentally literate. In the future, schools will have to provide environmental education programs that strive to improve upon present cognitive achievement of the average student population.

Students highly value environmental quality and are sincerely concerned about environmental problems. They believe problems are preventable and solvable. They feel more should be done by government, industry, agriculture, and education. They feel they are personally responsible for contributing to the prevention or solution of environmental problems.

Implications: Students have strong feelings about establishing a societal structure that works toward maintaining environmental quality.

Given that student cognitive scores on this assessment were considered lacking, it's possible that the present student population might be more inclined to make environmental decisions more on how they feel rather than on what they know. Schools should make every attempt to incorporate affective education methods in their environmental education programming. This would allow students the opportunity to analyze their values and beliefs relative to appropriate cognitive information (e.g., ecological and economic information).

Actual involvement of students in pro-environment behaviors or actions is limited or primarily viewed as a "sometimes" occurrence. When students do take actions they are prone to more personal actions like conserving water, picking up litter, or turning out lights. They are less inclined to pursue nonpersonal actions like encouraging others (e.g., family and friends) to practice pro-environment actions or behaviors. This limited pro-environmental action taking would seem to suggest that students do not view this behavior as an established part of their lifestyles.

Implication: Other areas of the student assessment clearly indicate that a strong majority of students expect a societal structure that establishes environmentally responsible behavior across all sectors. Additionally, they feel that they are personally responsible for pursuing environmentally responsible actions. The question then becomes, "Why are they reporting such limited action taking?" The statewide assessments of teachers and administrators (see next section) indicates that schools are providing limited educational opportunities in understanding or practicing personal or nonpersonal environmental action taking.

If the expectation is that environmentally sound behaviors become a part of this state's social norms, then the schools will have to develop educational programs that more readily help students understand and incorporate pro-environmental actions into their lifestyle.

IV. Improving Environmental Education in Wisconsin K-12 Schools

School administrators report they do take actions to support environmental education, however, most actions are more passive than active. Financial and personnel support specifically for environmental education is mediocre or lacking in many schools.

Implications: Substantial progress in environmental education might be achieved if it was afforded equitable (i.e., to other academic priorities) resource distribution. Districts could improve by identifying EE leadership positions (e.g., coordinators or specialists). Many schools could improve by establishing an active EE committee. These personnel appointments would serve to help promote EE, develop curriculum, and evaluate the effectiveness of the programs. Appropriate personnel appointments could be established by directly providing funds for positions or, more realistically, by providing appropriate release time. The establishment of these positions also sends a message to teachers that this is an important curriculum area and deserving of their attention.

Despite a 1985 mandate that environmental education be included in all school district curriculum plans, not all schools provide environmental education in the curriculum. Of those that do have an EE curriculum plan, a fair number of administrators are "not sure" or "dissatisfied" with the quality of implementation.

Implications: Obviously, if a school has no EE curriculum plan, or if it lacks the appropriate personnel to implement it, there is limited chance that students are experiencing a quality environmental education program. Correlation results from the teachers' assessment indicate that teachers in districts with active EE curriculum plans spend more time infusing environmental education. Additionally, teachers using plans are relatively more confident and comfortable with infusing EE.

Teacher preservice and inservice experience are a factor that seems to impinge on the amount and type of environmental education offered by teachers in the state.

Implications: Teachers who have experienced inservice or preservice environmental education report spending more time at infusing EE into the classroom. Additionally, they report feeling more confident and comfortable with infusing EE into the classroom.

Many (more than 50%) teachers who should have received preservice environmental education report not receiving it. It's possible that teachers received it and do not remember it (i.e., little or no impact) or their teacher education institution did not offer an EE experience. Obviously, teachers who have little or no EE training are not as likely to offer a quality EE experience to students as those who have had an appropriate EE preservice experience.

Many (25-40%) school districts have not offered any environmental education in-services, workshops, or courses in their district. Thus, teachers are having to seek out programs on their own or do without. The majority of teachers in Wisconsin hold pre-1985 (i.e., when the preservice EE mandate became effective) certification meaning they probably did not have an opportunity to experience preservice training in EE. Thus, there are a substantial number of practicing teachers who have had no formal training in what EE is, how to offer it, or how to evaluate it. Students experiencing classes with these teachers are probably less likely to do well on environmental education achievement than those who experience classes with teachers that have had appropriate EE experiences.

Summary

In general, Wisconsin has a K-12 educational atmosphere that is very supportive of developing and improving environmental education. Clearly the Wisconsin mandates in EE are effective, given that teachers are more active in providing EE if they had preservice training and/or if they are working in a district with an EE curriculum plan. There is however much room for continued improvement which is validated by the questionable achievement of students on the environmental literacy assessments. Additionally, there are a fair number of schools and teachers which admittedly are not offering appropriate environmental education to their students. Wisconsin will have to work on improving the quality of EE where it's presently provided and help to initiate EE where it is not being provided and should be.

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Creating Community within Environmental Education

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Common unity. Shared purpose. Shared responsibility. These are some of the attributes that characterize successful environment education programs. They are also some of the characteristics of healthy communities. Such characteristics can be applied to the development of many kinds and sizes of communities – including those that serve both education and the environment through the field of environment education.

The Context

The rapid rate of change in the world is one of the most powerful forces affecting the health and character of communities on many scales. As a result of this rapid change, numerous signs of institutional breakdown and ecological fragmentation surround us. People working in the field of environment education are uniquely prepared to make valuable contributions to improving the health of many kinds and sizes of communities.

Environment educators begin with the first classroom, the out of doors. Because nature has the best track record for success in sustaining healthy communities over time, it is an appropriate place to look for guidance. Nature is inherently renewable; that is, it has within its systems what it needs for continuing life. It practices principles of sustainability and teaches any of us who are willing students.

The entire field of environment education reflects a commitment to healthy communities. Project Learning Tree (PLT) and Project WILD (WILD) serve as a way to illustrate how attention to characteristics of healthy communities can be used to create and sustain educational programs. These characteristics are not unique to Project Learning Tree and Project WILD. Because they are the two programs I directed during a 17 year period from 1976 to 1993, I am able to draw on what we experienced as a set of guiding insights that others may find useful.

In the early years with Project Learning Tree, we were not as explicit about applying organizational principles from natural systems to our creating a sense of community among people as we later became in our work with Project WILD. In retrospect however, with both programs, we were clearly applying natural systems principles to developing and sustaining human relationships. We were growing communities of people, grounded in a shared commitment to the health of the living world.

Nature's Principles Applied to Human Relationships

The principles that I list below, and describe, were influenced greatly by the work and contributions of Bob Samples, Bill Hammond, and Milton McClaren. These principles serve as examples of the many ways in which observation of nature can guide human organizations.

Value Diversity

This is reflected in both Project Learning Tree and Project WILD by the celebration of each state's personalized approaches to implementing the programs in the context of a set of guiding principles. Similarly, each teacher was encouraged to adapt PLT and WILD activities to his or her students' needs. The overall instructional design of each program, and the educational activities within the programs, consciously employed diverse instructional methods and honored a variety of learning styles.

All Things Are Connected Within the Whole

One of the strengths of natural communities is the fact that everything is connected. Translating that to human communities, a commitment to a set of shared values and a shared purpose becomes important. Putting those notions to work in the context of Project Learning Tree and Project WILD, both programs make a conscious effort to state the program goal. The goal becomes the foundation for a set of shared values and shared purposes. Stating a common goal is not enough. In order for people to feel connected within the whole of a commonly shared purpose, much work must be done to keep communications healthy. As a result, both programs instituted annual "coordinators' conferences." These conferences, leadership workshops, and introductory workshops were the place in which the core values of each program could be shared first-hand. Ongoing communications through newsletters, surveys to tap priorities, personalized letters, conversational memos, and "WILD" reunions were among the many ways to work to keep the common culture, the culture of the community, intact.

Every Organism Has a Niche

Every person deserves to be greeted with respect and dignity, even if we don't agree with that person's views or actions. We can disagree honorably. Remembering the value of every organism helps us remember that every person, one at a time, is an important contributor to achieving a goal of informed and responsible action to benefit people and the environment. Both PLT and WILD began by honoring students – their capacities to learn, grow, and make a difference on behalf of healthy habitats for people and wildlife. They both honor teachers and respect their professionalism.

Nature Self Regulates

It is important in human communities for people to monitor and regulate their own behaviors. Being trusted to self regulate conveys respect. Checks and balances as well as appropriate support structures also have their place. The key is to develop and support an authentic capacity for self regulation. Translated into program policy, both PLT and WILD depend on a multiplier effect. Good people are trusted to do good work. Therefore, following leadership workshops, individuals are supported to spread the word to others – with belief in their capacities to do so responsibly. The results through the years have been outstanding. Thousands of people have conducted hundreds of thousands of workshops in turn reaching scores of millions of students. Each person's commitment to quality along the way is a form of self regulation.

Cooperation Is Natural and Healthy

Both programs reflect this premise in a variety of ways – including by use of cooperative learning strategies in the programs' educational materials. Both programs have had an historic commitment to encouraging access to a wide range of views when addressing value-sensitive issues. Partnerships for funding support, shared sponsorships, and collaborative projects with other programs and organizations are examples of a commitment to cooperation. The simple acts of sharing good works and good news through newsletters, regional gatherings, and informal conversations are all examples of a commitment to communication in support of the common good. Open communication is a powerful form of cooperation.

Energy Is Expended Optimally, Not Maximally

One of our anthems for years has been, "Pace yourself." That is, in part, because the alternative leads to burnout. If we always push ourselves and others to the maximum at all times, if we spend all our available dollars and save nothing for a rainy day, if we never think of the future and always live in the past or present, then we are not reflecting how healthy communities in nature work. In the long run, maximal expenditures of energy are not self-sustaining. That is also why topics like the "care and feeding" of volunteers, state coordinators, teachers, and students have always been legitimate emphases of both Project Learning Tree and Project WILD. To the extent that people are nourished, in balance, using optimal expenditures of energy, the communities within which we live and work will tend to be healthy as well.

Change Is Natural

Everything changes. Both Project Learning Tree and Project WILD are designed to teach the value of change as a natural phenomenon. Efforts to update, revise, and develop new materials and services are examples of holding that value.

Characteristics of Healthy Human Communities

In addition to these natural systems principles that are derived from observations of healthy communities in nature, there are other characteristics of healthy human communities that were used to guide Project Learning Tree and Project WILD, and which apply to any setting, program, or organization in which a sense of community is desired. Here are a few examples: Shared Responsibility, Common Values, Participation, Communication, Commitment, Equity, Openness, Respect for Differences, Acceptance, Trust, Collaboration, Reciprocity, Accountability, Efficacy, Perceived Skill, and Cohesion.

Conclusion

Environment educators are uniquely positioned to draw from principles of healthy communities in nature, and apply those characteristics to human relationships. The most successful environment education programs have done so intentionally. The principles that guided the development and implementation of two such programs -- Project Learning Tree and Project WILD – can be applied to the development of educational programs of many kinds. Further, those principles and other characteristics of healthy communities can be applied to a wide range of social settings – in families, neighborhoods, schools, businesses, municipalities, and beyond. We have much to learn about ways in which to build and sustain healthy human and natural systems communities over time. We find our best teacher right outside when we open the door to the living world.

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Life Paths into Effective Environmental Action

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Introduction

In 1980, Tanner initiated the study of significant life experiences of people who demonstrate responsible environmental action. He reasoned that if educators understood the type of experiences that contribute to lasting motivations for responsible environmental behavior, they would be better able to foster the development of an informed and committed citizenry. His work has introduced a series of studies of the backgrounds of environmentalists and environmental educators, using surveys, questionnaires, and structured interviews (for a review of this literature, see Chawla 1995; Marcinkowski & Sward 1995).

Because most of this research has involved samples of single populations, it allows no comparative statements. It has shown repeatedly that respondents attribute the sources of their environmental interests or action to experiences of natural areas or the outdoors, often in childhood; to parents and other family members; to teachers or classes; to involvement in environmental organizations; to books; and to the loss of a favorite place to development. Without comparison groups, however, it is impossible to claim that these antecedents distinguish environmentally committed people from the general public. A questionnaire by Sia (1984), based upon an interview study by Peterson (1982), suggests that these experiences can effectively distinguish more from less environmentally active citizens, in combination with the factors of knowledge and perceived skill in using environmental action strategies.

The preceding studies have all been located in single countries. A comparative survey of North American and British environmental educators is currently under way (Corcoran & Palmer 1995); but until results from diverse nations are in, it is impossible to know whether formative experiences are consistent across cultures. Before exporting environmental education recommendations to other countries, it is important to verify their relevance in different cultural contexts. Therefore the study reported here has compared the significant life experiences of committed environmental activists in the United States and Norway. This study is also unique in that it has covered people who work on diverse environmental issues, rather than just environmental education or wilderness and wildlife preservation. It has also examined the sequence in which significant experiences have occurred, in order to reconstruct typical life paths that people follow as they learn dedicated and effective action.

Sample

The study consisted of interviews with 30 environmentalists from Kentucky and 26 from Norway (35 men, 21 women). To ensure that respondents were, in Tanner's words, "citizens who have demonstrated amply their informed and responsible activism" (1980, p. 20), people were chosen who were cross-referenced by other well established activists, and they described the histories of their most important environmental efforts. In both countries, people worked on a range of issues: recycling and waste management; pollution and radiation; transportation; land use planning; habitat and wildlife preservation; environmental education. In addition, several Norwegians worked to promote sustainable lifestyles and Third World equity , and several

Kentuckians worked to regulate surface mining. Reflecting Kentucky's status as a state with few paid positions in non-profit organizations, Kentuckians were more likely than Norwegians to work as volunteers, and to cover different issues at different periods of their lives. In each country, the majority were between the ages of 30-49, and had college or university degrees.

Method and Analysis

In an open-ended, structured interview that lasted between one to two hours, people were asked to tell when and where they grew up and went to school, their parents' occupations, and their own vocations and environmental activities; to tell the story of their most important environmental efforts, and the sources of their commitment; to share their wisdom regarding how to work most effectively; to describe their vision for wise development; and to tell what strengthened them to continue their effort despite periods of discouragement. This paper focuses on answers to the question, "How would you explain the sources of your commitment to environmental protection? What personal experiences have turned you in this direction and inspired you to pursue it?"

Responses were taped and transcribed, and content analyzed with an attempt to replicate categories that had been established in previous studies, as well as to notice new categories. The categories derived are identified and defined in Table 1. Selected transcripts were coded by two independent judges, with an inter-judge agreement score of 85%. It was noted whether significant experiences were attributed to childhood, college/university years, or adulthood, and the life path that each respondent followed from birth through maturing adult activism was schematically summarized (Table 1).

Results

Each respondent attributed his or her environmental commitment to several sources. The average and modal number of responses per person was 4, with a range from 1 to 6 (80% giving 3 to 5 responses). The most frequently mentioned sources are shown in Table 2.

As in previous studies, the most frequently mentioned influences at each location were experiences of natural areas and the example of family members. In Norway, formative experiences of natural areas were exclusively identified with childhood – as were family members in all but one case (using the United Nations definition that childhood ends at 18). In Kentucky, these influences were connected to childhood in 92% of the responses. Therefore the two most salient influences, in terms of mention rate, were rooted in childhood.

When they were accessible and attractive, organizations – the third ranked response – were important at all life stages. In Norway, where the national organization Nature and Youth has a high public profile for dramatic and effective action, 27% of respondents described membership in this or other childhood organizations. In the university years, membership in Third World solidarity groups that studied environment and development issues, or other study groups, was important to 19%. In Kentucky, the Boy Scouts was the only childhood organization named (17%), and in a nation where there is no tradition of activist study groups, no college or university group was identified. Adult membership in local environmental groups, however, was important to 37%.

Negative experiences of pollution or habitat destruction, and education, ranked fourth and fifth respectively. The destruction of a valued place, which is a visible and personal experience, was important at each age, whereas alarm over pollution and radiation, which are less visible threats, were primarily associated with adulthood. In Norway, elementary and secondary school experiences were mentioned more often than university work (a 27% versus 8% rate of mention), whereas university teachers and classes were more important in Kentucky (30% versus 10%). Only Norwegians recalled secondary school teachers who candidly shared their own environmental concerns or led students in investigating local issues. Only one Kentuckian reported this activist style of teaching, in a special experiential learning program in college.

When the different sources of commitment are considered together, they show a pattern of changing importance at different ages. For three periods of life, Table 3 lists sources of commitment described by at least 15% of the respondents at either site, in rank order. Sources mentioned by 25% or more are boldfaced, by 50% or more, capitalized.

Discussion

The patterns of developing commitment that environmentalists report in Kentucky and Norway show more similarities than differences. Childhood experiences of nature and family appear critical on both sides of the Atlantic, as well as education, membership in organizations, and experiences of habitat destruction or pollution. Whether comparable samples from non-Western countries would be more distinct needs to be explored in future research. Nevertheless, some notable differences between the two countries appeared. It is surprising that Norwegians, from the homeland of deep ecology and sweeping Winter Olympic victories, mentioned the experience of nature less often than Kentuckians (65% versus 87%): until one notes that five Norwegians specified that their childhood experience of nature was nothing special because it is something **all** Norwegians enjoy. Therefore they felt that it could not distinguish them as environmentalists, important as it may have been to them personally. This reaction demonstrates the necessity of evaluating studies of significant life experiences in the context of cultural assumptions regarding what constitutes a "significant" experience.

Norwegian organizations' special success in involving children, teens, and university students in environmental activism deserves to be studied and emulated in the United States, as does the more activist style of teaching reported in Norwegian elementary and secondary schools. Finally, the fact that education ranks fifth in number of mentions in the combined sample emphasizes the need to think of environmental education in broad terms that extend beyond the formal boundaries of schools, in order to foster environmental learning in the family and community.

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Table 1. Sources of Commitment to Environmental Protection

Positive experiences:

Experience of natural areas: A valued childhood home or vacation place surrounded by a rural landscape, or by forests, fields, mountains, lakes, or seashore. An enjoyment of outdoor activities in natural settings, such as scouting, backpacking, canoeing, camping, bird watching. Fascination with flowers, birds, wildlife. Adult exposure to valued natural settings.

Family influences: Pro-environmental values learned from any family member: either through examples of appreciation or protection, or through explicit teaching. In later life, support and cooperation from family members for environmental efforts, or the desire to protect family from environmental damage (see separate category for children, grandchildren).

Organizations: Volunteer participation in childhood outdoor groups, university environmental or social equity groups, or adult environmental organizations or neighborhood associations. During environmental work, support and encouragement from an environmental group.

Negative experiences:

Habitat destruction: The build-up of a childhood area or other favorite place. Discovering a natural area destroyed, soil eroded, dying forests or lakes, declining species.

Pollution, radiation: Witnessing or fearing pollution, radiation, trash.

Education: Inspiring classwork or coursework, or extracurricular activities such as an internship, work/study position, field trips. An inspiring teaching or general school milieu. These experiences aren't merely useful to later environmental work, but motivate it.

Influence of friends: Being recruited into an environmental organization or job, or told about an environmental problem, by a friend. Support from friends during an environmental action.

Vocation: Experiences in a paid vocation which initiate or deepen environmental commitments.

Sense of social justice: Indignation at polluters' or developers' unfair treatment of oneself, one's family, community, or the poor and vulnerable in general. A belief in equity for all.

Book or author: An influential book or author with an environmental message.

Principles/religion: A belief that the creation is holy, or intrinsically invested with rights of its own, or that intact ecosystems are vital for the survival of life on earth, and therefore people have an obligation to protect the environment. A belief that environmental work makes life meaningful. A general sense that one must do what one understands to be right.

Concern for children/grandchildren: A belief that the present generation has an obligation to provide healthy living conditions for children now and in the future.

Table 2. Sources of Commitment to Environmental Protection Mentioned by Norwegian & Kentuckian Environmentalists (% of respondents who mention each source)

Sources of commitment	Kentucky (N=30; 20 M/10 F)	Norway (N=26; 15 M/ 11 F)	Combined sample (N=56; 35 M/21 F)
Experience of natural areas	87	65	77
Family	80	73	77
Parents	(67)	(61)	(64)
Others	(13)	(12)	(13)
Organizations	53	58	55
Negative experiences:	36	46	41
Habitat destruction	(23)	(23)	(23)
Pollution, radiation	(13)	(23)	(18)
Education	40	35	38
Friends	23	42	32
Vocation	30	23	27
Sense of social justice	23	27	25
Book or author	7	35	20
Principles/religion	10	19	15
Concern for children, grandchildren	0	8	4

Table 3. Sources of Environmental Commitment at Different Ages* (Ranked by order of mention at each age)

Childhood	University Years	Adulthood
FAMILY	Education	Organizations
EXPERIENCE OF NATURAL AREAS	Friends	Vocation
Organizations	Organizations	Friends
Education		Pollution
Habitat loss		Principles/religion
Social justice		

* All items were mentioned by at least 15% of the sample at one study site. Boldfaced items were mentioned by at least 25%, capitalized items by at least 50%.

Environmental Education: The Perfect Tool to Integrate Across Curriculum

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Abstract

Quite a few literature emphasize the importance of writing to learn science, or the writing across curriculum approach to make students' learning more meaningful, as well as to improve students' learning effectiveness. Indeed, this approach should not limit itself to science learning only. Integrating all the related subjects should be the final destination for us to achieve. ASCD's latest yearbook "Toward a Coherent Curriculum" describes the very need of such an education reform. Coherent curriculum, or integrated curriculum means meaningful teaching and learning to our students. Many social issues give themselves opportunities to serve as the carriers to implement this teaching strategy. Among them, environmental issues are gaining their momentum due to the deteriorated environmental quality, and the impact of these issues upon human beings' health.

This paper describes the underlying philosophy of the coherent curriculum and the empirical action research done by the author when he was teaching the "environmentally friendly" Science Method in a teacher college to help his students, prospective elementary school teachers, to become competent in teaching better science education, as well as moving toward a more environmentally friendly, and better elementary education. Indeed, this author would like to argue that if environmental education is to gain its proper position in the formal education sector, providing a meaningful learning environment for the students is its best vehicle to convince others.

Contemporary practice of elementary education

The following situations can be seen everyday in the elementary school teaching:

1. Teaching and learning are broken into sessions in which forty minutes or so are provided for each session.
2. Teaching and learning are broken into sessions in which different subjects are taught and learnt with almost no inter-relationship among the subjects being taught and/or learnt.
3. Teaching and learning are geared toward examinations and/or tests (the so called test-driven teaching and learning), with almost no real life meaning for teachers and students.
4. Tests and/or examinations are filled with multiple choices, truth-false, fill-in-the-blank, etc. to assess students' achievement. Many times, tests are provided to divide students into groups, such as the bright, the average, and those below average. Put differently, students are grouped into many groups according to their "ability" to pass through the examination.
5. Most school curricula are crowded with too much to teach and/or learn, if not over-crowded.

Given the current situation in the elementary school's teaching and learning, it is without doubt that many students fail to achieve their potential within schools. On the other hand, Gardner (1991, 1993) identifies that a person's ability can be classified into many different categories, memorization is just one of the many abilities a person might own. Therefore, good at memorizing what is written in the text should not be equalized to a capable person. The tests and/or examinations should be modified to include the many sides of intelligence. Meanwhile, tests and examinations should be used to detect or diagnose students' learning, not just to provide a cut-out line to divide students into groups.

The cry for educational reforms

Schooling is subjected to sever criticism due to the situations just cited. Given that environmental education is viewed by most school teachers as a science-related subject, the following discussion will be based upon those educational reforms taken by science educators.

Project 2061 and Science for all Americans were two examples of the science education reforms. One of the guiding principles is "less is more", which criticizes the contemporary curriculum. More science educators realize that less can be more when the new curriculum is carefully developed. More hands-on, and minds-on activities are included to help students to appreciate the beauty of science learning.

The United States of America is not alone when educational reforms were taken into consideration. Indeed, most countries have been revising their curriculum continuously. Taiwan is among one of them. In fact, starting from 1996, local textbooks of all subjects used in the elementary schools will be opened to those interested in curriculum development, which is a great step forward when the current practice is considered. At the present time, textbooks locally used in the elementary schools, with the exceptions of Arts and Music, have been developed, field tested, revised by a national center in charge of curriculum development. The time slot available for each and subject is now subjected to a re-distribution. One of the major guiding principles is to shorten the total units among all the subjects, which is similar to the underlying philosophy of "less is more". The time slots created under such a strategy are supposed to give teachers greater flexibility in their daily teaching.

Due to the deteriorating environmental quality, and the cry for better environment among the general citizens, many subjects tend to include environmental issues in the up-coming, revised textbooks. For example, science, social studies, and language arts do have several units with close relationship with environmental issues.

Effort to integrate environmental education in formal education

The approach most often adopted by educators is to "infuse" environmental education into the current subjects. Many supplemental resources have been designed to help environmental education find a niche through such an approach. Project Learning Tree (The American Forest Council, 1988), Project WILD (Western Regional Environmental Education Council, 1986), are good examples of such an approach. Meanwhile, many other resources, such as Project WET, a water education teaching material; A-Way with Waste (Washington State Department of Ecology, et al, 1985), Waste Away (Vermont Institute of Natural Science, 1989), two instructional materials to help teachers cover issues related to solid waste management; and the CLASS Project have all been written with infusion model in mind. A more recent environmental education teaching module, "Integrating environmental education into the curriculum painlessly (1992)" written by Walters and Hamilton, was another example of the infusion model. Judy Braus, the author of the "Environmental education in the Schools (1994)" provides a step-by-step approach for us to find a way into formal education, which includes more than infusion model.

Another approach frequently used to integrate environmental education in the schools is to provide an independent course that deals with environmental studies. Hungerford, and Stapp are the major proponents of such an approach. Issue investigation, problem solving respectively are promoted by them. However, more than plain knowledge is needed to fulfill the ultimate goal of environmental education. Chuck Roth (1992) explains that the ultimate goal of environmental education is to raise environmental literacy among all citizens. Infusion model, by its definition, has to fit environmental issues piece-by-piece into the current curriculum.

Even with such a great effort, environmental education is still viewed as an orphan by most elementary school teachers. Only a few states mandates the teaching of environmental education in their schools. Wisconsin, California are the two leading states in the United States of America to adapt this strategy to implement a state-wide environmental education program. Guidelines are provided for schools' reference.

The missing ingredients of the educational reforms

What can we do to increase the power of environmental education given that it is much more than plain knowledge increase? The answer is to provide the linkage between all the environment-related units. A quick examination of the current elementary school curriculum indicates that most subjects have been developed with their own philosophies. Therefore, we are talking about science education reforms, educational reforms for social studies, mathematics education reforms, etc. Without cross linkages between subjects, the up-coming curriculum can be even worse than the previous ones.

Meanwhile, curriculum integration is becoming more and more popular among many educators. Curriculum integration is an alternative approach to the fragmented approach currently used.

Without closely-tied cross relationship between the subjects, students often fail to acknowledge the meaning of school's learning. Beane (1995) explains that schooling may look like getting to know all the pieces of a jigsaw puzzle. Curriculum developers frequently work together only when the same subject fields are considered. As a result, the curriculum looks like fragmented pieces even after great effort has been done.

This situation can be modified if a coherent approach is taken to develop the curriculum. Coherent curriculum means more than integration. It means that the curriculum has to have cross subject integration during the developing stage. Case (1991) points out the four specific forms of curriculum integration: 1. integration of content; 2. integration of skills and/or processes; 3. integration of school and self; and 4. holistic integration. Case's first category is often taken as the only form of integration.

Some educators have worked on curriculum integration during the past few years. Activities that Integrate Mathematics and Science (AIMS), Great Exploration in Mathematics and Science (GEMS), Teaching activities that Integrate Mathematics and Science (TIMS), and Science - Technology - and - Society (STS) are some resources that have been created under the philosophy of curriculum integration. After years of working in the direction of curriculum integration, most field educators come to realize that integration between science and mathematics is not enough, and more effort had been done to create new integrated curriculum that interweave more subjects together. However, integration of school and self, and the holistic integration have been neglected by most educators, which can provide the best vehicle for education reforms.

The enriched educational reforms through environmental education

Environmental education can provide such a vehicle when we consider that it is consisted of three major components: learning from/about/for the environment. Environmental tracks, and outdoor field trips have been used to implement the "learning from the environment" component most frequently. Further more, this component can be easily achieved if we accept that the definition of environment include the nature and the artificial; social and culture environment; etc. Therefore, this component is executed whenever students are learning, even when students are learning in their own classrooms.

On the other hand, the activities created through the philosophy of infusion model often, if not always, employ the philosophy of the "learning about the environment". Knowledge is included in the infused units to help students to know the proper way our environment functions.

Granted that infused units can not achieve the designated goal of environmental education, nor can an independent subject entitled "environmental studies", how can we move from here? We should be able to develop a coherent curriculum in which social issues (including environmental issues) are used as the major vehicles to present various themes. Given that environmental education has the interdisciplinary feature, we should not separate its traits according to the current curriculum. Actually, we should put together a brand new curriculum that can make students' learning more meaningful.

The foreseeable problems lie ahead for a coherent curriculum are the proper sequence of the social issues chosen. One issue that we should plan ahead is that the new curriculum is to gear toward sustainable development. We can also expect a strong fight back from those who would like to emphasize the learning of economic development.

Methodology

This study is part of an empirical study, in which this author employs action research to study the impact of the new, integrated curriculum upon his students during a one-semester course: the science method, or a one-year course: General Chemistry. Several groups of students are under study for this research: the science education majored, and the non-science majored. All the students are currently studying in the National Taipei Teachers' College. Most groups have about equal percentage of male and female students. Students' learning logs are used to analyze students' interest in this course, which is matched by students' involvement in the lab work. The learning log is required with two objectives in mind. First, it provides students opportunities to reflect upon their personal learning during the lab works. Second, it provides students opportunities to learn critical thinking while they are writing their personal learning logs.

Conclusions

Most students, either those with science majored, or the non-science majored, reported that such a teaching strategy does help them integrate what they had previously learnt. The side effect of this teaching strategy is that some students refused to drink, or to use certain commercial products after they became aware that these commercial products did not have the claimed ingredients. Above all, most students feel empowered to learn by themselves even after they have finished the course works.

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Sustaining Involvement in Local Environmental Issues

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Though citizen participation has been the cornerstone of democracies around the globe, there has been, in the last 25 years, a precipitous decline in the level of civic engagement in communities throughout the United States (Putnam 1995). This has had a critical impact on both the environmental quality and the very heart and vitality of our communities. This paper explores the lessons learned from two projects working to strengthen communities through empowering citizens to become involved in local affairs. The projects share an emphasis on reaching broad new audiences through environmental education and community partnerships.

The Upper Valley: 2001 & Beyond

The Upper Valley: 2001 & Beyond (UV:2001) is a current major initiative of the League of Women Voters of the Upper Valley, a bi-state region of Vermont and New Hampshire. A volunteer project, UV:2001 is coordinated by staff from the Institute for Community Environmental Management, Antioch New England Graduate School. Our goal is to strengthen the vitality of Upper Valley communities through engaging a broad cross section of Upper Valley residents in exploring and working toward cultural, economic, environmental and social sustainability.

UV:2001 has been a rich example of the power of partnerships, involving significant content contributions from two University Extension Services, the state Department of Housing and Community Affairs and our Regional Planning Commissions. In bringing together such an unusual array of partners, UV:2001 has succeeded in attracting the positive attention of funders including grant support from a number of regional and statewide community foundations, as well as from local businesses and many private donors.

UV:2001 includes three components:

Community Profiles work at the local level, bringing together a diversity of residents of a given community for a day and a half facilitated process in which they assess the current strengths and weaknesses of their community, envision its future and plan specific action projects to build toward that vision.

Valley VitalSigns work at the regional level to provide relevant quantifiable indicators of the sustainability of our region. Developed by groups of people from throughout the region, Valley VitalSigns track and publicize data useful in making personal and business decisions, for example the percentage of youth involved in volunteer public service projects, the number of working farms, numbers of books taken out of local libraries, or the percentage of businesses which are locally owned.

Valley Quests offer a developmentally appropriate way for Upper Valley children to connect with their communities as 4th through 8th grade classes create maps and clues to special secret places within their communities and then exchange them with classes from their own and other towns, building an on-going regional treasure hunt. Other UV:2001 school programs include teacher workshops on place-based curriculum and opportunities for older children to be involved in Community Profiles and Valley VitalSigns.

Environmental Programs In Communities (EPIC)

EPIC works to facilitate locally initiated, positive change in Vermont's rural communities. Based at the University of Vermont Environmental Program, EPIC received substantial funding from the W. K. Kellogg Foundation. With an initial $1.2 million grant from Kellogg for the 1992-1995 efforts, supplementary grants, additional foundation and university support, and support from some individual Vermonters, EPIC has a $2+ million budget with current funding continuing through at least mid-1996. Several other funders have expressed interest in supporting EPIC into the future.

Directed by Dr. Jean Richardson, a former Kellogg fellow, EPIC represents the most comprehensive grant Kellogg had given to date. Program areas include:

Pasture Management EPIC works directly with farmers to institute rational intensive grazing. Many participating farmers find that by feeding their cows on grass, they improve soil quality, reduce run-off pollution, increase profitability, and save time; they are thus more satisfied in their family and community lives. Also, regular pasture support group meetings reduce farmers' isolation.

Rural Built Heritage Conserving our built environment saves both natural and historic resources. EPIC's historic preservation efforts emphasize the connection between communities and their cultural history.

Rural Marketing Techniques EPIC's economic projects have focused on strengthening the network of local business communities. With good communication, businesses often find that neighbors have the answers to their problems.

Conservation Commissions Through these volunteer organizations, citizens offer expertise to municipal officials. Every town chooses different issues to focus on; EPIC helps create the structure and resources needed to keep the communication flowing.

Youth In Conservation Vermont's high school students have come together annually to exchange information and project ideas at the EPIC-sponsored Youth Environmental Summit (VT-YES!). While EPIC offers the structure and resources for the Summit, the students provide the ideas and leadership.

Rural Leadership Working with the Extension System, EPIC offers training to potential leaders who have little or no participation experience; skills include public speaking, research techniques and conflict resolution.

Seed Grants Small grants of up to $2000 support projects which have broad grassroots support and focus on building connections between various community interests.

EPIC's overarching concept is one of interconnection; our goal is to help re-weave the fabric of rural communities. Not a top-down, service-delivery project, EPIC focuses on citizen empowerment through community action and on helping people help themselves with the projects that they have identified as mattering most to them.

Hungerford and Volk (1990) argue that environmental citizenship is not only based on knowledge and empathy but on a complex of factors including the perception that one has the ability to effect change. These scholars and others argue that active participation is critical to engendering citizenship skills. Similarly, we have found from preliminary evaluations that as important as money and resources are, they are not the most important thing EPIC provides. Instead, participants are most vocal about the confidence they have built due to participation in projects that are meaningful to them.

EPIC's internal evaluation has been ongoing throughout the duration of the project, so although the formal evaluation period is only beginning, some of the project's stumbling blocks have already been identified. One is the time frame: the EPIC project was initially designed as a five-year project, and building the internal academic coalitions necessary in the foreshortened three-year period was very difficult. In addition, university systems in general reward research but not community service. Even in the case of this land-grant institution, those project leaders who worked in academia and expected support for their community service efforts were disappointed.

These pitfalls notwithstanding, initial evaluations indicate that each of the EPIC project areas listed above has met or exceeded its individual goals, with both supportive participant feedback and positive media coverage. In addition, EPIC is more than the sum of its parts; connections among projects were intended to create a synergistic community-building effect. Some of these connections are evident: for example, leaders have applied for seed grants to work on conservation commission and historic preservation projects, and students coordinated an environmental education video on rational grazing.

It is from EPIC's successes, and those of the UV 2001 project, that we gleaned the "Ten Hot Tips" that follow.

Ten Hot Tips For Sustaining Involvement In Local Environmental Issues

1. *Know yourself, and know why you want participation.*

All members of your effort should be clear about your mission, goals, and action plans. When community members hear a consistent message, it is more likely to inspire trust and involvement. Similarly, take time to examine your motives regarding participation. Are you only interested in education and support building, or will you actually share power? Be clear with yourself and potential participants about what you are seeking, and choose techniques to match goals.

A corollary tip: Know who your friends are. Citizen participation may seems like Mom and apple pie, but some groups, whether in the public or private sector, wish to avoid stirring up trouble with this admittedly messy, time-consuming process. In both the EPIC and UV:2001 projects, some municipal officials had to be convinced that citizen participation was not going to be just another "add-on" to their over-booked schedules and over-taxed patience. Do the research necessary to identify your allies, and consider a preemptive education campaign where there may be resistance.

2. *Start where people are.*

Don't expect people to start out being as excited about your topic as you are. Remember that you are competing for people's attention along with many compelling activities including work, family, friends, plus other "good causes" like yours. It's your job to prove that your efforts are relevant to their interests. Flyers inviting people to join your cause aren't enough; if you want people to come to your meetings, first go to theirs.

We love the story of Nona Estrin, an EPIC participant who dreamed of creating a nature trails network in her town. Nona worked to build the cooperation of landowners, innkeepers, and others interested in these multi-use trails. Nona might have hit a stumbling block in trying to engage the local snowmobile trails group in her effort; after all, she did not snowmobile, and could expect to be perceived as an "elite environmentalist." However, rather than ignore this important constituency, Nona became active in their group, being up-front about her interest in linking their passion for trails with hers. Although she still does not snowmobile, Nona now enjoys a sincere link with, and support of, this group – and even became the secretary of the East Montpelier Gulley Jumpers!

3. *Don't be afraid to touch people's hearts* .

You can reach people through humor, curiosity, hope—in short, through the issues that are of the most immediate concern to them (what Brazilian revolutionary and popular educator Paulo Freire [1970] refers to as "generative themes"). A citizen-oriented commission on democracy in Vermont, supported by EPIC, was interested to find that according to recent research on Vermont's town meetings, participation at this community level can't be predicted by any of the usual guideposts such as socio-economic status or education. In fact, one of the only things that brings people out to meetings is whether a hot issue is on the table (Bryan 1995). As the study's author remarked to the commission (Vermont Secretary of State, 1994), "People show up when they figure they can get their tail burned if they don't!"

Similarly, creating a sense of momentum is critical. Make your project "the place to be." UV:2001 succeeded in attracting a lot of interest in a day long meeting on sustainability indicators by working with the local daily paper to produce four mock front pages from the year 2010 each depicting radically different, funny and provocative scenarios for the future of the region.

4. *Ask for what people can give.*

Make the first steps of involvement easy. Ask people to do specific tasks which they are really interested in and know that they are uniquely qualified for. Define each task and attach a time frame. And no matter what the stage of involvement, make sure that tasks have a beginning, a middle, and a clearly defined, easy-to-recognize end. For example, the mock front pages described above languished until they were taken on by a committee who had been involved in scenarios planning for our recent hospital move and got excited about making them come alive.

5. *One personal contact is worth a hundred press releases.*

Fundraisers know this when they have the wealthy people on their board contact all of their friends. The Extension System has acted on this in the past with its technique of bringing together rural neighbors to discuss agricultural innovations. You can't rely simply on letters or press coverage to get to your audience. Attract a few movers and shakers, as well as a broad cross-section of other community members, and encourage them to involve their friends and colleagues. People are interested in people. UV:2001 has tapped this enormous power by publicizing the names of the members of all committees as often as possible, including creating special letterhead for each town's group.

6. *Understand and pay attention to the media.*

Yes, we know, we just said that one personal contact is worth a hundred press releases. But still, people also read the papers, hear public service announcements on the radio and TV, or they know people who do. Make sure you're well-versed in media relations and protocol; find a good workshop on this topic because these skills are critical. In both EPIC and UV 2001, we have found success through ferreting out the media that people actually pay attention to. For example, we have not counted solely on the major newspaper, but also the local weekly advertising paper (often surprisingly widely read), church newsletters, and radio talk shows.

7. *Create a structure that people can live and grow with.*

We can't necessarily count on citizens' participation in traditional groups – churches, community service groups, etc. – to build civic maintenance skills. Increasingly, community organizers must provide fundamental training and structure, because many citizens lack a healthy primary experience in democracy and community-building. Activist and scholar Harry Boyte (1984) writes, "even the terminology of 'community organizing' or 'community action' [is] problematic. What does it mean to 'organize' a community that has little sense of itself?"

Create a structure which brings people together, involves them and makes them feel accountable, then keep communicating all progress and successes. After short-term engagement is achieved, long-term involvement will follow.

8. *Learn, practice and teach the arts of democracy.*

Activists Frances Moore Lappé and Paul DuBois (1994) remind us that we aren't born knowing how to participate in community activities; we need to learn and teach participatory skills. You won't find any parliamentary procedure tricks on their list of the "Ten Arts of Democracy"; rather, Lappé and DuBois point to the need for such skills as active listening, creative conflict, and public dialogue.

At the EPIC-sponsored Addison County Conservation Congress, rural Vermont residents came together from all sides of divisive environmental issues. Importantly, coordinators began the day with a plenary session clarifying active listening, facilitation, and other group process techniques. Despite the fact that some of the participants' previous experience with each other was limited to testifying against each other in public hearings, this refreshingly non-charged atmosphere allowed many to find common ground.

9. *Say please. Say thank you. And respect people's time.*

This seems obvious, but it's easy to lose your head once you're caught up in a project. To avoid burn-out, remember to start and end meetings on time, stick with the agenda you promised to address, and don't ask people to do more than they've volunteered for.

Keep in mind that there does not need to be a hierarchy of pleases and thank-yous. Heads of committees don't have a monopoly on this critical function – everyone can and should take part. Even though we all may be doing the same amount of work, we all need to hear that it's worth it. Then we're willing to keep on working. EPIC budgets for an annual "thank-you" dinner where participants can display their projects and network about their successes. Although we are only hosting a simple meal, we have found that the energy in the air at this event is palpable. Such recognition is vital, and people name the event as a highlight of working with us.

10. *Have fun.*

Group outings, ice cream socials, family-oriented "work" parties – these will bring people into the fold better than any fancy brochure. We sometimes joke that the "P" in EPIC stands for "Pizza" since we have hosted so many gatherings where people met and discussed ideas over food. Indeed, both EPIC and UV 2001 have found that food and fun are key components of any citizen-based project.

As Rutgers professor and grassroots campaign expert Peter Sandman (1982) writes, "People often come to meetings because they'd like to eat some good food, socialize, feel involved, meet new people, and get away from their families for a while.... And people often join organizations because joining them seems likely to help satisfy these or other social needs." Once people have become involved for personal reasons, he notes, "people look for – and find – good reasons."

In addition, having fun is simply an important way to build friendships and community connections. An informal slide show highlighting past successes and activities where the whole family to be involved, can make the difference between work and team-work.

Ben and Jerry ask, "If it's not fun, why do it?" Your participants, consciously or subconsciously, will ask themselves the same question.

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Environmental Studies Partnerships and Other Innovations: A University Level ES Workshop

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The Environmental Careers Organization

Abstract

The Environmental Careers Organization facilitated a workshop designed to help undergraduate environmental programs help their students to achieve their environmental career goals. We presented the results of our research on interdisciplinary undergraduate level environmental studies programs and the careers of their graduates and invited eight speakers to provide examples of how they are using communication, collaboration and partnerships to identify career needs and trends; cultivate internship opportunities; build program-community partnerships; develop career resources; and, increase diversity in environmental studies programs. The workshop provided many opportunities for small group discussions so that participants could learn and share from the experiences of their peers.

Introduction

Many institutions of higher learning are seeking new ways to prepare students for professional involvement in growing environmental fields. One product of this initiative has been the creation of "environmental studies" programs at over 130 public and private colleges in the United States. The number of interdisciplinary environmental studies programs is growing, both in terms of number of programs and enrollment, and many more colleges are considering development of new programs The remaining years of this decade will see an increasing number of environmentally-related programs which will need to meet the growing demands of students, employers, faculty and the environment.

As the number of programs and enrolled students grows, and the job market changes, several important career-related questions arise for colleges and universities, the programs and their students:

- What are interdisciplinary environmental studies programs trying to achieve?
- Is the interdisciplinary, undergraduate environmental studies education an appropriate platform for launching an environmental career?
- How well are undergraduate environmental studies programs preparing their graduates for environmental careers?
- What careers are alumni of environmental studies programs pursuing?
- What factors are important in environmental studies graduates obtaining environmental careers?

The Environmental Careers Organization (ECO) recently completed an eighteen month study entitled *Environmental Studies: 2000* to examine these questions from a career development perspective. The report provides a national overview of undergraduate, interdisciplinary environmental studies programs and the careers of their graduates and examines how these programs are meeting the career needs of students and the needs of employers.

The *Environmental Studies: 2000* research included alumni surveys of 1,393 alumni of from twenty-nine colleges and universities, five focus groups with fifty-nine environmental employers, and five focus groups with thirty-nine faculty of environmental studies programs nationwide.

Some of the major conclusions of the study include:

- Environmental studies programs vary greatly in structure, size, age, educational mission, curricula, and emphasis on career development This variation leads to several issues including:
    - Difficulty in employers' understanding what graduates have to offer;
    - Difficulty in students' understanding what the degree can realistically provide;
    - Difficulty in newly-formed programs' ability to identify useful models.
- Cultural diversification of the undergraduate environmental studies population is a critical unmet need;
- Sixty-four percent of environmental studies alumni surveyed are in environmental careers, comparable to the percentage of social science and natural resources graduates entering professions related to their degrees.
- Internships, particularly paid internships, are a significant factor in attaining environmental careers after graduation.
- There is a conspicuous lack of communication between employers and environmental studies programs -- cases of partnerships are the exception rather than the rule.
- There is a conspicuous lack of communication among and between environmental studies programs to share information, knowledge, successes, and failures. This leads to duplication of efforts and waste of limited resources.

Based on these and other conclusions, one of the primary recommendations ECO made to programs, career services staff, employers, administration, and students was to increase the number and level of communications, collaborations and partnerships in order to meet the needs of the many "stakeholders" of the environmental studies mission.

This ECO workshop was designed to provide a forum for faculty, career services staff, employers and students to discuss issues, barriers, and solutions in identifying career needs and trends; cultivating internship opportunities; building program-community partnerships; developing career resources; and, increasing diversity in environmental studies programs.

The workshop began by asking the participants to introduce themselves and describe what they most hoped to get out of their participation in the workshop. This was followed by presentations covering the development of communications, collaborations and partnerships and the results of the *Environmental Studies: 2000* research. We then began the interactive portion of the workshop in which participants were brought together around the four major areas they had identified as their most important needs from the workshop.

Self-Identified Needs Of Participants: Issues, Barriers, Overcoming Barriers

The vast majority of the self-identified needs of workshop participants fell into four categories:

- Developing and maintaining career resources for students;
- Creating and improving internship programs;
- Changing environmental studies curricula to incorporate career needs; and,
- Increasing diversity in programs and the workforce.

The workshop participants broke into small groups to discuss the major issues they faced related to these needs and ways they are, or could, working to overcome the barriers.

The discussion of barriers further reinforced the *Environmental Studies: 2000* findings about the problematic lack of communication between and among programs, employers and students. For example, the group that discussed creating and improving internship programs identified the following barriers:

- Lack of knowledge about internships; hard to define them
- Students, faculty, and employers alike are not sure who to contact for internships
- Lack of communication between 1) career service office and faculty, 2) students and organizations, 3) advisors and students, and 4) departments
- Benefits of internships are not clear; there are no standards; faculty advising is lacking
- Employer commitment to internships vary and are inconsistent
- Geographic constraint
- Lack of institutional support
- Credit for internships often not granted
- Disseminating information to students and employers is a challenge
- Students preparation for internships is lacking
- Lack of time for students to do internships; coursework gets interrupted

The ways they suggested to overcome the barriers clearly point to an increase in communication, collaboration and partnerships.

- Look at ways to communicate; form processes in setting up internships
- Look into cooperative programs as a way of getting institutional commitment
- Try to get federal work/study money for students to work at non profit organizations
- Consider offering credit for internships
- Send direct mailings to organizations for job leads
- Set up an internship matching office
- Use advisory boards from the university and community to help with contacts, process
- Inform career services office about departmental needs
- Give students more time flexibility to do internships

The results were similar for the other discussion groups. This interactive activity helped to set the stage for the remainder of the workshop.

Examples Of Communications, Collaborations, And Partnerships

One of the toughest questions for students, according to one student who participated in the workshop, is "How do you make money in an environmental career and at the same time have a lifestyle that is sustainable and live out the values?"

Four environmental studies faculty, two employers, and one career services director spoke for ten minutes about how they had used communications, collaborations and partnerships to increase career resources and opportunities for students, develop and manage internships, design or shape their curriculum, and increase diversity. The speakers all described different ways that they used communication, collaboration and partnerships to help students address that difficult question of integrating values, career and lifestyle. Following the presentations, each speaker hosted a concurrent roundtable discussion to answer detailed questions. The speakers then summarized their roundtables.

David Jumper of Baylor University teaches a course on developing environmental careers. His course emphasizes "teaching them how to fish". It provides "real-world" situations where students need to create a long-term vision for themselves and create a plan for getting there, network with environmental employers, visit workplaces, and conduct mock interviews. David tells them to learn how to sell themselves into positions that may not already exist by "convincing employers who don't know they need you why they need you". In an economic downturn, he stresses that it only becomes more important to know how you can contribute to the bottom line.

Deborah Solowczuk, career services director at University of Michigan School of Natural Resources, says SNR developed their own career resources center due to a survey of their students which found that students weren't getting what they needed from central career services. Deborah started out with a $5,000 budget for two student interns and a career fair. From there, the career center has blossomed. It provides detailed profiles on 3,500 environmental employers, an alumni advising program, career fairs, career guides, career and job search seminars, and more. One of the keys to their success is collaborating with central career services and other schools such as the School of Public Health, Law School, etc.

Steve Hoffman of the University of St. Thomas described how their environmental studies program requires each student to have core courses and a concentration. After they finish the core, the students go into a seminar where each student in the seminar is from a different concentration. Together, the students must produce a 75-100 page research project. Each seminar has mentor from the community. "This makes students have contact in the real world." The goals of the seminars are to have students make contact with people in the field, develop in-depth research, and combine in-depth concentration with interdisciplinary thinking. When asked how he selects mentors for the seminar, Steve says, "they are all friends of mine who I trust and work with. It is largely an intuitive process."

Lauren Schroeder of Youngstown State University presented an overview of the process used to design the newly-created program. "Communication, collaboration, and partnership were essential to developing this program." First, an advisory committee was formed including YSU, local employers, and other educators. Next, surveys were conducted among incoming students to YSU and five other local colleges. This study showed that about 20% of the students were very interested or interested in environmental careers. A subsequent survey of employers in Ohio showed a projected 40% increase in the number of environmental jobs in the next five years. When asked which skills were most important communication ranked first (written and oral communication were tied), followed by teamwork. "When students work in teams, we often call that cheating," said Dr. Schroeder of the academic tendency to discourage cheating. Due to this finding, the YSU program requires teamwork through a capstone course.

Bruce Olszewski of San Jose State University described how his program "uses internships to fight the disease of cluelessness" among students. He acknowledges that professors are overworked, but stresses that they need to help with internships. SJSU encourages at last two internships since they feel it is important for students to find out what they like and don't like. He stressed the importance of feedback, both good and bad, for the supervisor to evaluate interns and the interns to evaluate the experience. Based on his experience coordinating internships for the department, Bruce has developed many resources and tools for students, other professors, and intern supervisors to use.

Sheila Milliken, an environmental engineer with the US Environmental Protection Agency described how the Office of Air has developed a formal partnership with North Carolina A&T State University. The partnership was begun to help the US EPA compete for technically trained personnel and to increase the diversity of the agency. Since NC A&T State University is a Historically Black University, this partnership helps EPA to meet these goals. One of the most important elements of the partnership is an internship program called student training. A well-managed program, these internships include detailed pre-planning by the agency, a built in element of accountability, frequent feedback meetings, a "job shadowing" component, a seminar on getting a government job, social activities throughout the internship, mentors, and a closing program that the interns are charged with running. Summarizes Sheila, "environmental education is crucial to EPA, but also for citizens as a force to protect the environment."

In Conclusion...

It was clear from the feedback we received at the workshop and in the written evaluations that faculty, career services staff, and employers are hungry for opportunities to share with and learn from each other. Nearly everyone who completed the evaluation said he/she was leaving with specific ideas to implement after leaving the workshop. Our premise turned out to be true: Everyone is an expert in what he or she does and has something to offer. Everyone has needs and benefits from the input from others. As Lauren Schroeder pointed out in his summary statements, "We underestimate the value of teamwork. It is not only helpful in solving problems, but is less stressful. The concept comes from ecology – competition doesn't last long; what lasts long is cooperation."

Exploring Common Grounds for Environmental Education

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Introduction

Environmental education is a major component of the global environmental movement. Traditionally, the principal contribution of this sector of education to the movement has been to create awareness among learners and citizenry of "activities" that might influence the health and capacity of the planet to support life (Harblin and Maynard 1970). In addition to creating awareness, conservation efforts of varying magnitudes have been made by the environmental educators. These include various environmental programs, action groups, alliances, and projects in many parts of the world.

The last two decades (1970-1990) have been very instrumental in developing the concepts of environmental education in the world. According to Smith (1970), outdoor education has contributed substantially to learning and to teaching – extending the school curriculum to encompass all of the outdoor learning environments in the community. Evolving from outdoor education, environmental education has evolved and has been integrated into the curricula of educational institutions in many parts of the world in varying degrees and at different levels.

Following the curve of progress made by the environmental education movement during the last few decades reveals interesting growth patterns. Certain milestones have been the trend setters in the countries where the movement is in its advanced stages. At the same time, some pitfalls experienced by these 'progressive' players do indicate the failure of some strategies.

If these experiences are carefully assessed and attention paid to the outcomes, these learnings could help us design and implement more progressive national and regional environmental education programs. For this purpose, we need to examine the barriers as well as gateways encountered by those involved in shaping the Environmental education movement into what it is today.

This paper looks at the development of environmental education movement in the United States during its early phases (1960 - 1980) to identify trends during this period. The nascent stages of the environmental education movement in a developing country such as Pakistan is then examined to establish common grounds, if any. This is done with the hope that shared experiences will help develop successful strategies and foresee any pitfalls that need to be avoided.

The 'developed' notions

During the past fifty years, there has appeared on the American educational scene a curricular development that has been historically known by a variety of terms, such as camping education, school camping, and resident outdoor education. These instructional innovations have gradually been implemented in an increasing number of school programs utilizing the out-of-doors as a learning laboratory (Hammerman 1980).

Outdoor education in the United States began as school camping which took a holistic approach in the late 40s and early 50s . It assumed that school camps were children's communities - where children were, for a week or two, both the subject and object of an experiential period of time, removed from the adult centered community in which they spent most of their lives (Donaldson 1980). As a result, America experienced an increased interest and participation in outdoor leisure activities by people in all walks of life.

William Hammerman identifies 1960 to 1969 as the period for resurgence and innovation in education. According to him, the value of resident outdoor education continued to have an impact on the school sector during this period. But the period of new directions was to be 1970 to 1979. Environmental education became a major thrust of outdoor education programs in this decade, and many more programs have been developed since then. The activities vary, but the essence - the direct experience approach to learning - is still the same.

According to Roth et al. (1980), environmental education has emerged as an interdisciplinary process with significant historical roots that are intertwined and linked with most resident outdoor education ideas and thrust. A number of education related movements have impacted this sector resulting in substantial influence on environmental education as well. Of special significance are four intellectual thrusts of the last century namely : nature study; conservation education and related resource-use education; progressive education; and science education. Each movement in turn helped to support, refine and strengthen a relationship between resident outdoor education and environmental education. The goals of these relate directly to the goals of environmental education today i.e. develop an environmentally literate citizenry that can lead a fulfilling life which does not impair the planetary support systems for living things (Roth 1978).

Outdoor education provided a reservoir of environmentally-oriented methods and activities which have been tested over a period of time and proven successful. These related approaches have become institutionalized through policies, mandates and legislation for environmental education. Examining the strategic successes and pitfalls that our predecessors encountered helps in understanding the relationships that existed between these related fields.

According to Roth (1978), some of the following were the fundamental barriers that influenced the progress of the environmental education movement in the 70s.

- Many environmental education projects received financial support from the federal government initially but could not survive when this was to be replaced by local funding.
- Expected monetary assistance as suggested by the Environmental Education Act of 1970 never reached the funding level needed to accomplish the task of creating widespread environmental literacy.
- The public did not see environmental education as an issue; they were more concerned with the performance in the area of the 3 R's.
- A considerable amount of environmental education material had been developed in the last decades. These needed to be continuously tested in the field to evaluate their usefulness and changed accordingly to meet the needs. Support of teachers had to be sought for this which turned out to be a stumbling block.
- Environmental education tended to strive for the development of an informed citizenry; but vocational education appeared to be more important than citizenship education. The main reason for this was the employability of the generalists as compared to specialists. The holistic approaches to education led to the development of generalists.

- In spite of the attention being given to life-long learning, little was done in the field of adult environmental education programs.

Some of the foundational actions that helped in moving environmental education towards the direction it is in today were the successful development of a knowledge base and positive attitude towards the environment at all levels. This required a multi-pronged approach focusing on educational programs – formal ones through the schools , and non formal ones through a variety of educational media. These efforts covered all aspects – scientific, technical, social, cultural, aesthetic, economic – and helped citizens understand the relationships and harmonize their needs within ecosystem processes.

The National Environmental Education Act of 1990, re-emphasized the need to increase public understanding of the natural environment and to advance and develop environmental education and training. The act created an office of environmental education that serves a variety of roles including support, development, and dissemination of model curricula, educational materials, and training programs for elementary and secondary school students, teachers and other interested groups (National Environmental Education Act of 1990, p.3).

Presently, a number of environmental educators recommend plans of action to include integration of conservation concepts into the general curriculum, coordinating outdoor work with indoor activities, and for planning and implementation of sequential strategies in the formal and non formal education sectors.

The 'developing' notions

The global environmental crisis has reached the point where it is no longer possible for a handful of people to consider the situation manageable and develop strategic plans for it. Instead, a concerted effort is needed by society. Environmental education movement has become important to many citizens across the world; and a great deal of resources have gone into creating fields of educational research, training and curriculum development that focus on basic environmental concerns. Considerable efforts are needed to further clarify the role of environmental education as previously defined in addition to the present concept of the school and of the citizen's responsibility.

In Pakistan, the development of philosophy and goals appropriate for environmental education is in its infancy. As declared in *The Way Ahead* (1994), if education is seen as long term systematic learning that gives people knowledge and problem-solving skills to improve the quality of their lives, then environmental education will help people make informed choices about natural resource use. Under the ideal circumstances, there is no denying this definition and role for environmental education.

However in the real world, there are a number of factors that inhibit the progress and possible achievements of environmental education in the country. The learner is limited by the socio-economical boundaries to effectively participate in the programs. The two basic values of conservation ethics and a community spirit needed to bring about the change and make the programs successful are greatly affected by high poverty levels and low literacy rates.

As a dimension of learning, environmental education is not a new venture in Pakistan. Environmental education has a long history going back to many centuries, as can be judged from the folklore, cultural traditions and religious values. Its roots in education are embedded in a co-curricular activity that existed as nature study at least three decades ago. The learners and teachers did not term it as environmental education but the end sought was the same i.e. to introduce the natural world and its interrelationships and conservation to the learners. Unfortunately, this concept was gradually replaced by science and technology education as people became 'development' oriented to compete with the rest of the world. However, some basic concepts of environmental education such as recycling, reusing and reducing are still practiced today and are a way of life with citizens of Pakistan. The recycling industry provides hundreds of jobs to a large number of people on a daily basis.

Pakistan is neither a major global polluter nor a large consumer of resources, hence contributing negligibly to the degradation of the global environment. However, a major threat to the environment is the country's rapid population increase. Pakistan is a densely settled land, with four times as many inhabitants per hectare as the globe as a whole (The Pakistan NCS 1992 p.9). As a result, this creates a tremendous pressure on the limited amount of natural resources available in the country. These facts imply the urgent need for aligning Pakistan's education programs to its environmental goals. An awareness created in the citizens of Pakistan through formal as well as non formal and informal channels of education needs to be promoted. Many efforts in the government as well as private and non governmental sectors exist today.

In the formal sector, Pakistan has been particularly neglectful of [formal] education, even by South Asian standards (The Pakistan NCS 1992 p.144). Therefore, the only way for introducing environmental education in the formal sector is by integrating it in the existing curricula. This needs to be supported through developing resource material and training teachers for using the new material. Predominantly focusing on the younger generation, the formal education sector can help expand the critical knowledge mass among learners. Adults can be approached through adult education programs for a positive impact on long term learning.

A comprehensive Government initiative to develop a concern for the environment through formal education was initiated in 1986 by the Ministry of Education and the Environment and Urban Affairs Division with the assistance of the South Asian Co-operative Environment Program and UNESCO. The Co-ordinated Environmental Education Program (CEEP) was aimed at training teachers, educators, decision makers, and planners. It also worked on curriculum research, the production and testing of environmental education kits and material, and better liaison with national, regional, and international agencies in this field (The Pakistan NCS 1992).

More than 50% of the country's population is under fifteen years old, out of which roughly 5% get an opportunity to attend a formal educational institution for primary education. The rest spend their childhood in intensive economical activities. Non formal, informal and workplace related educational activities could motivate them towards an awareness of local environmental issues. Indeed, some efforts by private and non profit NGOs in this direction have proved effective and could be replicated on a larger scale.

Some basic decisions need to be considered by the policy makers to bring about the change so urgently required. A few of the barriers envisaged by those active in the constrained field of environmental education are:

- The environmental education concepts are perceived by reasonably intelligent and knowledgeable people in the educational world; and their support has helped develop interests in environmental education. This is mainly because these people see and understand the environmental degradation about them. But these people have not taken environmental education on as their responsibility and have not provided the directional force so needed. These leaders are also quick to back away from environmental education and its goals when its implications begin to stress the bureaucracy.

- The reality of environmental education often conflicts with the traditional bureaucratic approach to education. Thus verbal support of environmental education is much greater than actual support. When education planners are asked to put it in rank order priority with other educational issues, they generally place it well down the list.
- Most educators are not aware of how environmental education can contribute to resolving some of these other educational issues.
- Most teachers now teaching have had no training in the areas that make education truly environmental; furthermore, they are not overly eager to obtain that training/education.
- The teacher employment picture is so grim that new teachers who may have had some kind of environmental education training have little chance of being employed on that basis. As a result, chances of practicing environmental education are also reduced.
- A considerable amount of environmental education material has been developed in the last few years but most of it has had very limited use and distribution. It needs real testing and study before more is generated.
- Environmental education in Pakistan tends to cater to the already enlightened and resourceful citizenry. This needs to change if we want to reach out to a large number of population. Workplace education is more important then formal education for this purpose.
- Much of the academic enlightenment offered in the name of environmental studies and environmental education in the arena of higher education is not itself holistic, systematic and experiential. It is very discipline oriented, with an essentially 'science-based focus'.

The non-governmental development organizations have been the key spark for development of environmental education and they will have to remain so, for indirectly leading the government agencies into accepting their proper role in supporting and institutionalizing basic environmental education. They will also have to take the lead in developing and implementing environmental education in the non formal sector of the education system.

The private sector of education is also a promising channel that could play a model role in developing experiential education for the environment. A range of efforts, however limited to the privileged sector of the society, already exist and with the necessary modifications could be replicated.

Shared learnings

Reviewing the progress made by the environmental education movement in the U.S. during the period 1970-80, and in Pakistan during the period 1985-95 reveals some interesting and similar patterns. It appears that the attitudes of decision makers, public perceptions, monetary considerations and development of educational activities in both countries followed similar paths during the period under study.

A major learning here is that if the policy makers and educators in Pakistan keep in view the American experience while planning their own programs, then there is a possibility for them to avoid the pitfalls and learn from the successes. These indicators, of success and of failure, could help Pakistan in avoiding re-invention of the wheel.

Identification of 'real' environmental concerns remains high on the list of environmentalists. The attempts to find answers and implement solutions need to focus on the relevancy of these issues to the daily experiences of the leaner.

If a long term or permanent change in attitudes leading to behavioral changes is conceived as the solution, then there is a need to develop strategies to achieve this. This is the real challenge if we are serious about protecting the global environment. The sincere efforts could focus on a re-accommodation between developing and developed areas of the world in defining and then acting on what is effective environmental education for a sustainable future.

In sum, environmental education of the future must find its way between the scales of fragmented knowledge as provided by the educational institutions and the realities of life. To do this, environmental education must become a catalyst of disciplinary knowledge and guide us towards new, purposeful general education as it has the best chance of leading us into the future which will have new challenges for us.

However, as Stapp (1976) very rightly says, the last word remains with the general public upon whose will educators, scientist and decision-makers depend. Unless people become more fully aware of the world around them, and more sensitive to their total environment, the will to achieve essential environmental goals will still be lacking.

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Student Teachers and Environmental Issues: Evaluating their Intended Behaviours

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Introduction

Evaluating attitudes to environmental issues has proved to be particularly difficult and there are very few examples of research in this field. However, it is important to find ways of achieving this in order to a) develop appropriate teaching strategies and b) assess the effectiveness of programmes. To enquire into attitudes and possible behaviours the authors have adapted a psychometric model of enquiry into reasoned action and planned behaviour which has been shown to have wide applications in many areas of human behaviour in different countries and contexts. The methodology, analysis and an indication of some of the findings are the main focus of this paper.

Rationale and Methodology

Environmental education is concerned not only with knowledge and understanding but with attitudes and behaviour. An attitude is defined as a disposition to respond favourably or unfavourably towards something. Attitudes are theoretical constructs and are not accessible through direct observation. They must be inferred from measurable responses, mainly behaviour or a statement of intention to behave in a certain way. The approach to measuring responses devised by Fishbein and Ajzen (1980) has been used extensively by social psychologists, particularly in studies of consumer attitudes to a wide range of issues, such as use of drugs, alcohol and smoking. This approach is based on the 'theory of reasoned action and planned behaviour', the essence of which is that voluntary or reasoned behaviours have three main components (Figure 1):

(I) cognition, which includes expression of beliefs, evaluations of the outcomes of behaviours and the knowledge and understanding on which they are based;

(ii) perceptions of normative behaviour, which includes the effect of family, peer and peer leader pressure;

(iii) perceptions of control that people have over the situation, which includes the degree to which they feel they have the power to choose courses of action.

The theory is based on aggregation, that is, it does not relate to single instances and takes into account the fact that many behaviours are difficult to measure or observe directly and that probably the best that can be achieved is self-reported intentions to behave in a particular way.

This type of technique allows analysis of the powerful factors that affect predispositions of individuals to behave in a particular way. It also allows some analysis of which factors are likely to be most significant.

A range of actions covering a spectrum of environmental behaviours was selected for this study (Figure 2). Some were direct actions, like recycling glass, others were less direct such as supporting political parties pledged to specific environmental policies. For each of these actions, questions dealing with each component of the model were devised, yielding a questionnaire of some 120 items. Each of these was scored on a seven point scale between either likely/unlikely, or good/bad or favourable/unfavourable, depending on the context.

The questionnaire was given to 89 students following a one year Postgraduate Certificate of Education pre-service course for secondary teachers. The ages of the students ranged from early 20s to mid-40s; they specialised in a broad range of curriculum areas. The model was not explained to the students prior to giving them the questionnaire neither were they asked to put their names on the forms.

Results and Discussion

Analysis of the results involved:

(i) generating frequency-distribution histograms which show the spread of responses to each question;

(ii) Spearman's Ranked Correlation applied to responses related to the three cluster elements of the model: behavioural beliefs, outcome evaluations and attitudes; normative beliefs, motivations to comply and subjective norms; control beliefs and perceived control;

(iii) multiple regressions between attitudes, subjective norms and perceived control with behavioural intentions.

It was found that while the frequency-distribution histograms show variation, in some cases there is a skew towards positive responses, sometimes of an extreme kind. This is particularly marked in the case of some of the behavioural beliefs, e.g. use of the car (Figure 3). Similar patterns were obtained for use of CFC-free aerosols, use of tropical forest hardwoods and use of energy in the home. Strongly skewed distributions of positive responses were also obtained for all of the outcome evaluations and for attitude responses to use of CFC-free aerosols and support for local environmental action groups.

A particular feature of the model, as used here, was that it allows comparison between three different kinds of normative influence - family, friends and those considered experts. Responses in relation to the normative influences of family and close friends show a broad distribution indicating that these are often fairly weak. There was generally a tendency for more strongly held positive views relating to normative beliefs based on the opinions of experts.

The responses relating to personal control over a given situation show few strong positive feelings, suggesting that many respondents felt that their personal control over many of the issues was limited.

Overall, the results show that within the broad range of questions relating to different aspects of environmental behaviour, most of the students expressed positive attitudes. The most consistent distributions across the different elements of the model were those concerning the use of tropical forest hardwoods, and also recycling of glass and the use of CFC-free aerosols. A tentative explanation may be that in areas where the issue is most straightforward. i.e. where there is reasonable information available and individuals are able to exercise more control over both their behaviour and its outcomes, they tend to make supportive statements about environmentally responsible behaviour.

For some behaviours, where there are many implications for basic aspects of lifestyle, such as the use of a car or the use of water or energy in the home (Figure 4), the frequency-distribution histograms show less clustering at the extremes. This wider range of response perhaps reflects a greater ambivalence towards what may be deemed appropriate behaviour towards the environment, despite the fact that most students knew about the effects of such behaviour.

Those aspects which relate to more indirect action, such as support for political policies in relation to particular environmental issues, at both local and national levels, show different patterns again. Here positive responses were given in terms of behavioural beliefs and attitudes, but there was less evidence of normative effects or feelings of control over the problem through this type of behaviour (Figure 5).

Spearman's Ranked Correlations show a high level of internal consistency, normally with significant probability values of 0.05 to 0.01. This indicates that overall the model was performing in a reliable way with few of the elements producing correlations which are not statistically significant (Figure 6).

Regressions again show high levels of internal consistency (Figure 7). For some of the thirteen behaviours related to the environment, such as involvement in local environmental improvement schemes, responses indicate that one factor, such as subjective norms, is most closely associated with behavioural intention. For others, the degree of perceived control seems to be the most closely associated, for example in responses related to the use of the car. There are also examples where two factors appear to be equally associated with behavioural intention, as in the case of use of tropical forest hardwoods where attitudes and subjective norms produce similar scores. In a few cases the three arms of the model seem to be equally balanced, for example support for national political parties pledged to the development of alternative energy sources or conservation of water or energy in the home.

Overall, while attitudes appear to be most consistently associated with behavioural intentions, the associations with normative beliefs and perceived control are also frequently strong indicating that in many cases the model supports the notion that behavioural intention is likely to be influenced by several different factors.

Conclusions

Some advantages of applying the 'theory of reasoned action and planned behaviour' to exploring student teachers' behaviour towards the environment are that it:

(i) diverts emphasis from attitudes to behavioural intentions;
(ii) links attitudes to cognition;
(iii) links attitudes and behaviour to normative influences, e.g. peer and social pressures;
(iv) emphasises personal action rather than that which it is felt that members of society in general should do.

However, although the model seems to be consistently reliable throughout the study there are concerns about validity; i.e. have we actually tested what we say we have tested.

A further important application of the Ajzen-Fishbein model is that it could be used to enable teachers to reflect upon the different factors which effect behaviour towards the environment. The educational implications of addressing behaviour, linked with acceptable pedagogical methodology, could be part of a self-awareness approach to teacher education.

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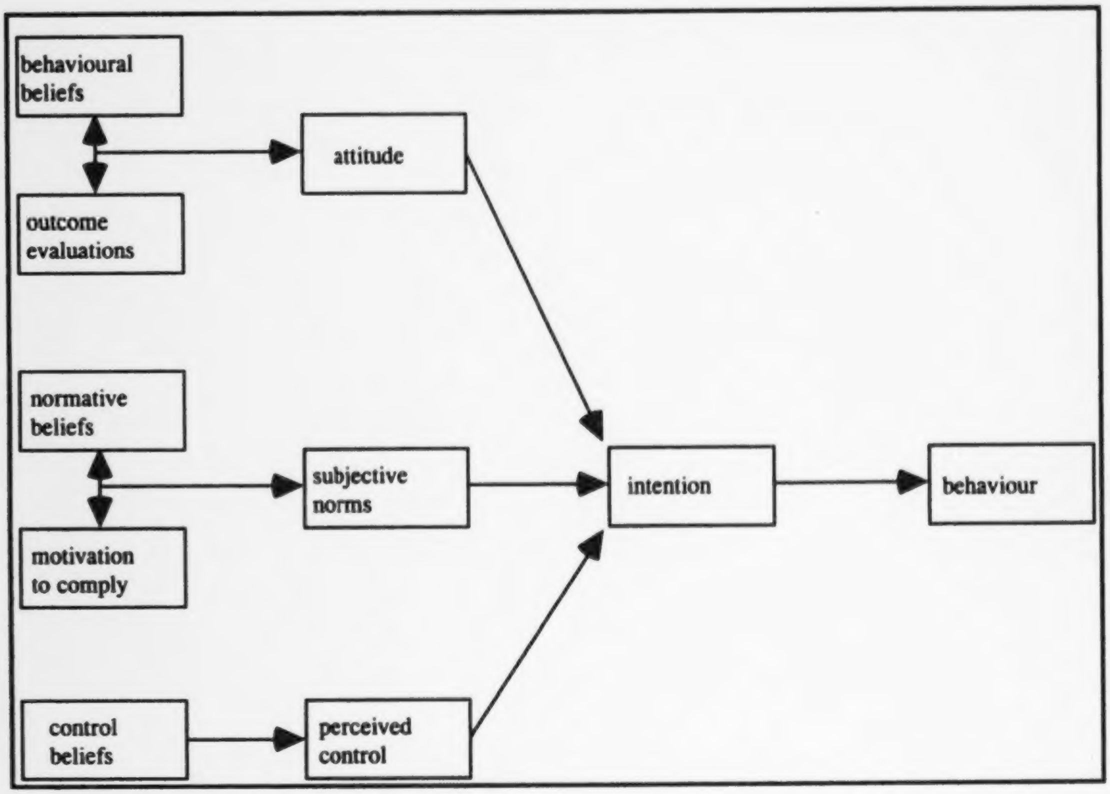

behavioural beliefs
outcome evaluations
attitude
normative beliefs
motivation to comply
subjective norms
intention
behaviour
control beliefs
perceived control

Figure 1: Model of reasoned action and planned behaviour

Use of CFC-free aerosols
Personal use of a motor car
Support for a national political party committed to reduction of road building
Support for a local political party committed to improve cycle facilities
Recycling glass
Use of tropical forest hardwoods
Conservation of energy in the home
Conservation of water in the home
Support for local environmental action groups
Finding out about the impact of everyday products on the environment
Personal involvement in environmental improvement schemes
Support for national or international environmental organisations
Support for a national political party committed to alternative renewable energy

Figure 2: Actions upon which the questionnaire was based

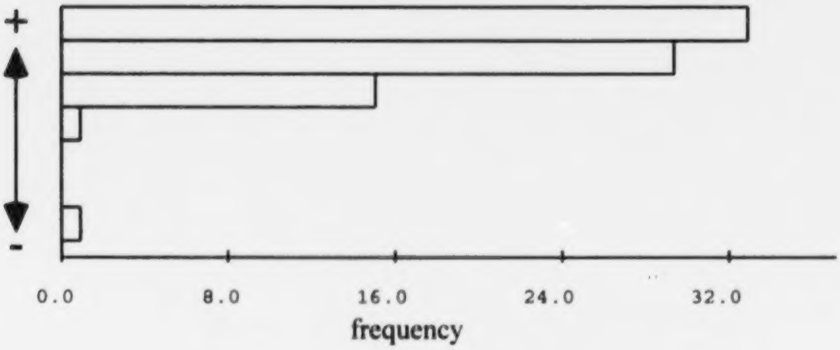
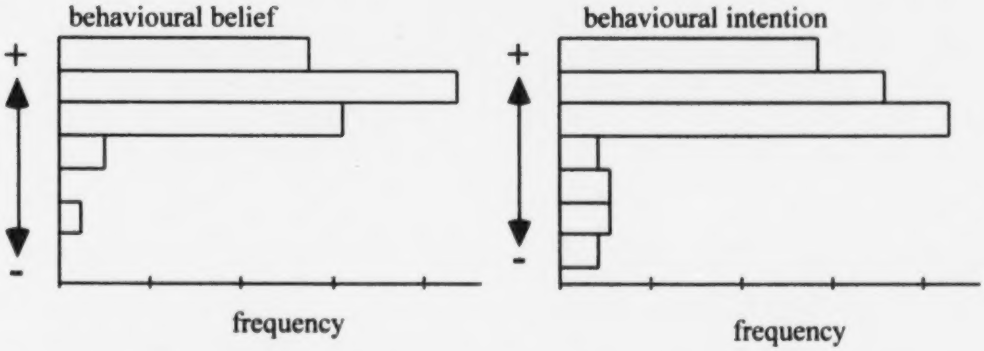


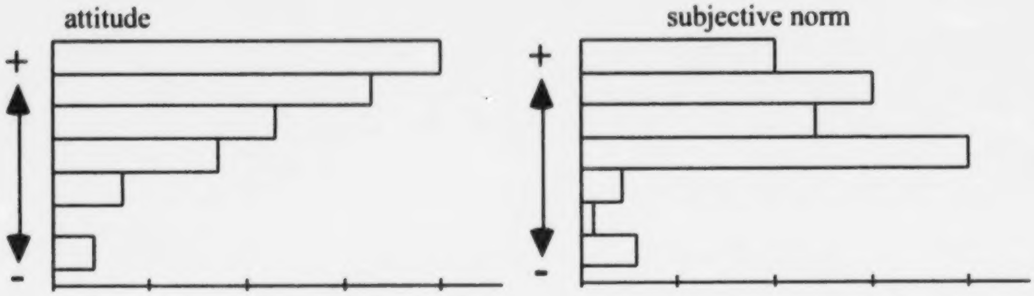
Figure 3: Frequency-distribution histogram of behavioural beliefs related to the use of the car



My using less energy in my home would reduce environmental damage

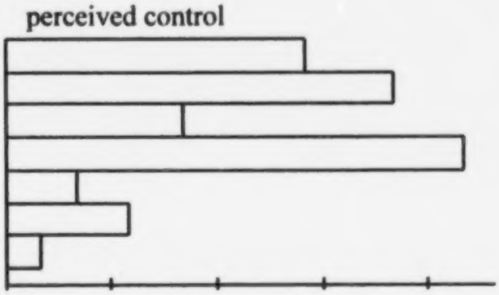
I intend to use less energy in my home

Figure 4: Frequency-distribution histograms of behavioural beliefs and intentions in relation to the saving of energy



My attitude to supporting in national election the party which is pledged to the reduction of major road building projects is...

Most people who are important to me think that I should...



For me, in a national election, to decide whether or not to support...

Figure 5: Frequency-distribution histograms of attitude, subjective norm and perceived control in relation to support for a national political party pledged to reduction of the number of major road building projects

TOPIC	AXBB-OE	NBFXM C1-SB	NBCFX MC2-SB	NBEXM C3-SB	CB-PC
Use of CFC-free aerosols	O.310	0.442	0.417	0.417	-0.286
Use of motor car	0.431	0.443	0.386	0.386	-0.605
Support for national political party for reduction of road-building	0.346	0.298	0.368	0.368	0.078
Support for local political party for improving cycle facilities	0.556	0.342	0.504	0.504	-0.048
Recycling glass	0.569	0.420	0.424	0.424	-0.581
Use of tropical forest hardwoods	0.557	0.278	0.377	0.377	-0.391
Conservation of energy in the home	0.318	0.340	0.49	0.49	-0.480
Conservation of water in the home	0.524	0.425	0.550	0.550	-0.373
Support for local environmental action group	0.486	0.421	0.538	0.538	-0.137
Improvement of knowledge on the environmental impact of products	0.328	0.302	0.407	0.407	-0.496
Involvement with environmental improvement schemes	0.491	0.354	0.486	0.486	-0.355
Support for national & international environmental organisations	0.534	0.358	0.515	0.515	-0.462
Support for national political party pledge to alternative energy	0.403	0.388	0.401	0.401	-0.140

Significance levels:
$p>0.01$ for +0.28 or above or -0.28 or below
$p>0.05$ for +0.17 or above or -0.17 or below

Figure 6: Results from Spearman's Ranked Correlations

	A†	SN‡	PCÎ
Use of CFC-free aerosols	++	+	++
Use of motor car	+	+	+++
Support for national political party for reduction of road-building	++	++	+
Support for local political party for improving cycle facilities	+++	+++	+
Recycling glass	+++	+	+++
Use of tropical forest hardwoods	+++	+++	+
Conservation of energy in the home	+++	+++	++
Conservation of water in the home	+++	++	+++
Support for local environmental action group	+	+++	++
Improvement of knowledge on the environmental impact of products	+++	+	++
Involvement with environmental improvement schemes	+	++	+
Support for national & international environmental organisations	++	+	+++
Support for national political party pledge to alternative energy	+++	++	+++

+ = no significant association $(p<0.05)$

++ = significant association $(p>0.05)$

+++= highly significant association $(p>0.01)$

† = attitude

‡ = subjective norms

Î = perceived control

Figure 7: Relative degree of association between behavioural intention, and attitude, subjective norm and perceived control for the thirteen environmental actions

Moving on from the Elders

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Introduction

Australians have not really developed our own "Wisdom of the elders" but rather have taken our discourses from the colonisers. Also, because we have been so incorporated into the dominant Western discourses, there has been a tendency to adopt these discourses unproblematically. While it is important to celebrate these foundational discourses in environmental education it is equally important to critique them in relation to questions which may guide future practices. In this paper I take the wisdom of some of the elders who have influenced development of environmental education, and deconstruct the "wisdom" for its mechanistic scientific, Amero-Eurocentric and, particularly, gendered approaches in the hope of providing an Other perspective on future directions for environmental education practices.

My intention is not to criticize the content of these statements but to draw attention to the context in which they were developed, in the hope that this will lead to a recognition of the silencing of others that has occurred in the framing of environmental education's dominant discourses.

Silences In The Framing Of The Dominant Discourses

As I examined the foundational statements it became apparent to me that in the past, women and other marginalised groups have been overlooked in most environmental education policies and programs through being subsumed into the notion of "universalized people". However, women and other marginalised groups have a distinctive contribution to make to environmental education pedagogy, research and policy development which needs to be foregrounded.

Women were noticeably in the minority at the international gatherings which formalized conceptions of environmental education, and in the publications which arose from these meetings. For example, women were out-numbered by men more than 5:1 at the UNESCO-UNEP Intergovernmental Conference on Environmental Education held at Tbilisi, USSR in October 1977 (UNESCO 1978), and male authors and editors outnumber female authors and editors of the UNESCO-UNEP Environmental Education series volumes more than 3:1.

While all sorts of explanations can be found for the small representation of women at Tbilisi and in the authorship of UNESCO publications on environmental education, the absence still has its consequences. For example, this absence of women can be related to the epistemological framework of environmental education being very much that of a man-made subject and to the content of the corresponding curriculum and research programs tending to be determined by male agendas.

The role of women in achieving sustainable development was recognised in the Rio Declaration (1992): "Women have a vital role in environmental management and development. Their full participation is therefore essential to achieve sustainable development." However, women's access to education can be limited. For example, the literacy rate for women in Pakistan as a whole is estimated at only 23 per cent, and in villages as nil (del Nevo 1993), and gender as well as caste affects women's access to education.

Although silenced as well as colonized and marginalized, women do have a vital role in environmental education: they are often responsible for the health and nutrition of their families as well as their other duties, and their involvement is essential if we are to overcome the barriers to successful implementation of environmental education. As a way of overcoming the barriers perhaps, as Sandra Harding (1991: 268) suggests, we should be moving from "including others' lives and thoughts in research and scholarly projects to starting from their lives to ask research questions, develop theoretical concepts, design research, collect data, and interpret findings... that would provide less partial and distorted accounts of nature and social relations".

The dominant accounts of the environment and its problems, and the modern Western development views of science that dominate them, do not encourage starting from others' lives. Rather, their authors know the one true story and they are concerned with implementing their message. Yet we know their message is flawed. It is grounded in the same view of science that has precipitated the environmental crisis—so should we not look elsewhere, start from others' lives, to look for solutions?

Feminist and postcolonial critiques of Western science add another dimension to the context in which the foundational statements of environmental education were framed, as does an analysis of their educational orientations.

Deconstructing The Foundational Statements

The story of environmental education in which the founders are inextricably entwined has its roots in an environmentalism of the rational scientific variety, where the earth is conceived of as an object of instrumental value, there only to meet human needs. Accompanying this rational scientific approach to the environment is a vision of a socially reconstructed, environmentally responsible society which can be achieved through education. Education is seen as an instrument for achieving the scientists', or environmentalists', goals. The scientific environmentalist roots of environmental education are easy to trace through the literature of the 1960s and 1970s, in, for example, the writings of Rachel Carson and Paul Ehrlich. It was the scientists who were calling for environmental education as an essential response to the perceived environmental crisis at this time.

The roots of environmental education are not just in rational science; a Western, Eurocentric, English-speaking, and developed worldview has dominated the statements and discourses of environmental education for much, if not all, of the past two decades. In this claim I include the original Stapp et al (1969) statement as well as those emanating from UNESCO.

For example, most of the trend papers presented at the 1975 UNESCO Belgrade workshop (UNESCO 1977), which was convened by Stapp as director of IEEP, were biased towards the developed world (Fensham 1976). This domination did not go unchallenged, although it was silenced at the time. That politics continue to be played, and voices continue to be silenced at United Nations meetings, is encapsulated in a reaction to the 1992 United Nations Conference on Environment and Development by a representative of the Quechua people of Bolivia, Guillermo Delgado-P. (1993: 3) who wrote: "Given that questions of environment and development both closely affect Indigenous cultures, one might assume that Indigenous peoples would have been at the centre of discussion on policies of viable environmental conservation. However, in circles where international decisions regarding development and environment are made, the voice of Indigenous peoples is hardly heard".

Colonised races and peoples have intimate experience of the politics of oppression and repression and have been forced to articulate their experiences in the language of their oppressors. Thus in environmental education we need to be working to disrupt the oppression of the native voices and listening to people expressing themselves in their own languages.

Postcolonialism and feminism have developed as parallel discourses which have much in common. Feminist and postcolonial discourses both seek to re-instate the marginalised in the face of the dominant (the former coloniser), and both are oriented to the future, "positing societies in which social and political hegemonic shifts have occurred" (Ashcroft et al 1989: 177).

Feminist critiques argue that "Women in many societies have been relegated to the position of 'Other', marginalized and, in a metaphorical sense, 'colonized', forced to pursue guerrilla warfare against imperial domination from positions deeply imbedded in, yet fundamentally alienated from, that imperium" (Ashcroft et al 1989: 174). The experiences of India's Chipko movement (see Merchant 1992, Shiva 1989), and the Kenyan Greenbelt Movement (see Merchant 1992), are examples of women pursuing ecological guerrilla warfare as attempts to maintain or achieve sustainability.

Since the seventeenth century European colonisation in the Americas, Africa, Asia, Australia and the Pacific has resulted in a colonial ecological revolution that has disrupted native ecologies and native peoples' modes of subsistence. Shiva (1989) links the violation of nature with the violation and marginalisation of women in the Third World and Merchant (1992: 200, 201) argues that "many of the problems facing Third World women today are the historical result of colonial relations between the First and Third Worlds", and that "Third World women have born the brunt of environmental crises resulting from colonial marginalization and ecologically sustainable development". However Third World women "are making the impacts of colonialism and industrial capitalism on the environment and on their own lives visible" (Merchant 1992: 206).

In this there is both a challenge and a dilemma (or two or three) for educators. The politics of difference goes beyond being "simply oppositional in contesting the mainstream (or malestream) for inclusion", and beyond being "transgressive in the avant-gardist sense of shocking conventional bourgeois audiences". It aligns itself "with demoralized, depoliticized and disorganized people in order to empower and enable social action and, if possible, to enlist collective insurgency for the expansion of freedom, democracy and individuality" (West 1990: 19). We need to be aware that there are ways other than those to which we are accustomed for looking at the environment and its problems. And we need to be aware that those ways and the voices that accompany them have to date been silenced in the dominant discourses of environmental education. This critique has, however, only recently been applied to environmental education (see Greenall Gough 1995).

Historically the educational research approaches adopted by environmental educators were mainly quantitative. The curriculum development model has also tended to be of the centre-periphery form, and has been very knowledge oriented. As Peter Fensham (1987: 2), one of the Australian participants in the 1987 Moscow UNESCO-UNEP International Congress on

Environmental Education and Training, commented, "the model for teaching and learning that the draft document uses is an outdated one that relates better to the curriculum era of the 1960's and early 1970's than it does to post Tbilisi views in education that the prior experience (knowledge and attitudes of learning—whatever the target level) and their social contexts are quite essential elements in the effectiveness of teaching and learning". This conclusion by Fensham, who was present at all three IEEP international meetings on environmental education—Belgrade, Tbilisi and Moscow—indicates that some of the foundational statements in environmental education have passed from documents into monuments, and this occurred in the early days of the environmental education movement, the late 1960s and early 1970s.

Into the Future

Although the foundational statements of environmental education are an important consideration for future directions in environmental education, it is equally important that we are aware of the stories of which these statements are a part. These stories include an Enlightenment view of science and knowledge that places humans above nature—nature has no intrinsic value, only a utilitarian value—and a gendered worldview which marginalizes women.

We should celebrate our elders for the contributions they have made. They are not to be blamed for the stories of which they are a part. However we should acknowledge that the elders are part of the stories of their times and read their wisdom in terms of these and other stories.

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Teacher Thinking and Practice in Environmental Education: Issues of Research Method

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Good thinking proceeds from the friction between reflective thought and real problems.
(David Orr, 1992, *Ecological Literacy*)

This paper reported a number of methodological dilemmas encountered in the first year of a three-year study of Canadian elementary school teachers' thought and practice in environmental education. The Teacher Thinking and Practice in Environmental Education Project, funded by the Social Sciences and Humanities Research Council of Canada (SSHRC), was designed to examine current environment-related teaching practices from the teachers' perspective. The purpose of the study is to try to understand, and to help teachers understand, the complex of thought and action that characterize environment-related activity in Canadian elementary schools.

Initially, conceived as a collaborative venture with Joy Palmer, in England, and Ian Robottom, in Australia, the study focus was teacher subject matter knowledge. Although the study retains strong ties with the British and Australian work, I have reconstructed the study to fit the Canadian context and to address specific issues of Canadian education. For example, it is interesting that no one seems to have an adequate knowledge and understanding of the nature of the environment-related school experiences of Canadian elementary school children. No one knows what guides teacher planning. And there is no curriculum mandate for environment-related activity in any of the provincial or territorial curriculum guides, although such activity is encouraged or even recommended in most jurisdictions.

These issues have generated many questions about environment-related activity in Canadian schools. For example, where do teachers obtain materials for these activities and what screening mechanisms exist? And, what do children take away from these environment-related experiences in common teacher- or school-initiated projects such as the SEEDS Foundation "Learners in Action" program or Project WILD? Assuming that teachers have deeper underlying reasons for their environment-related practices, my primary interest in this project is in trying to unravel the complex of relationships that live in the dialectic between thought and action. My interest is also in problematizing the inquiry process by which educational researchers and teachers struggle to understand mutually educational thought and practice.

Given an interest in teacher thinking as it relates to practice, the first problem is how to find out and how to help teachers find out about the complex relationship between teacher theory and practice. Because we have undertaken to learn how to understand, and because we are seeking to help teachers learn how to understand their personal practical theory in terms of their experiences and activities, we have adopted methods of inquiry which are informed by a critically interpretive perspective of knowledge and reality. In other words, we have tried to engage a method of inquiry that includes consideration of both human consciousness (thought) and political action (the act of engaging in an unmandated teaching action) and which as a result is capable of responding to moral and social questions about this form of education. We believe that a critically interpretive form of inquiry, while problematic in terms of the traditional educational research paradigm, is consistent with the ecophilosophical worldview which underlies environmental education, that is, that the research should be at least capable of participatory, socially critical, holistic, and action-oriented forms of inquiry.

According to Elbaz (1991) in order to understand educational practice whether as researchers or teachers, we must engage in discourse. In explaining what they do and why, teachers tend to tell stories of their experiences, and stories are a form of narrative. The theory of narrative sees humans as natural storytellers. So, we assume that the way teachers view themselves and their work can only emerge through their stories. This view of research, which seeks to understand interpretively, is based on the epistemological claim that teacher knowledge is ordered by story and is best understood this way. And, according to Winter (1989) story is analogous to theory, personal practical theory, just as Tolstoy's theory of history is embedded in his story *War and Peace*. Biologist and Seneca First Nations elder Henry Lickers, at the recent Canadian Environmental Education Network (EECOM) Conference at the Frost Centre north of Toronto, Ontario, referred to these stories as naturalized knowledge systems. In explaining what they do and why, teachers tell stories of their experiences and this can be understood as their personal practical theory of the situation, that is, a situated naturalistic theory in narrative form.

Our dilemma, as researchers scratching around to try to understand such a complex teaching-learning situation, is how to get to know teachers well enough so they will tell us their own authentic stories and so they will try to probe beneath their own stories to understand the foundational assumptions and values that drive them, and beyond that to problematize these stories so they can be reconstructed in light of this deeper and perhaps critical awareness and self consciousness as a means of improving both thought and practice. We contend that one cannot occur without the other and that change involves "seeing to the heart" or the very essence of our own value system.

In adopting the perspective of research as a form of narrative inquiry we have begun our work by searching for stories. According to Florio-Ruane (1991) conversation as method is most likely to yield stories as data. So our initial approach to research involved trying to engage teachers in authentic or genuine conversations about their environment-related experiences with children in elementary school classrooms. We view our conversations in terms of a hermeneutic cycle rather than a linear process, which often characterizes autobiographical methods. We recognize, following Elbaz (1983), certain limitations of human communication such as lack of logical consistency and partial coherency but we are prepared to accept partials in our struggle for mutual understanding. We recognize the importance of conversation in distinguishing differences between what Hollingsworth, Dybdahl, and Minarik (1993) describe as personal/experiential reality (believing) and cognitive reality (knowing) and are attempting to create conditions for this to happen. We also recognize in our attempts to understand teacher thinking and practice that our search is for only partly patterned, partly organized complexity. And we recognize that language is a problem. For example, research in teacher thinking employs a variety of terms to characterize teacher thinking including the following: personal constructs, images, perceptions, personal practical knowledge or theory, or meaning perspectives. We recognize that the conditions for real conversations depend on certain sensitivities that may be personality driven and may be different, depending on the situation or circumstances, and thus may imply differences in method depending on many circumstances including culture and context. Some researchers can engage this kind of inquiry, some simply cannot precisely because the method depends on certain sensitivities and relationships which are rapidly apparent in personal communications.

In spite of these issues and dilemmas of method, we have found in the first year of our study that teachers are willing to share their stories in conversations with us. They seem quite willing to share their own sense of a deep personal commitment to environmental concerns based on fundamental value positions. Our problem as researchers is in capturing these stories authentically, in the teacher's own voice. In trying to generate accounts, for the teachers prefer that we do the writing, we have asked ourselves about the form of discourse we use. We ask how it allows for authentic expression of teacher experiences, how it helps communicate personal meaning, how it captures the teacher's view of reality and of pedagogy? We ask how we, as researchers, can remain clear about where the teacher's story ends and ours begins.

In summary, as a result of our early experiences with a narrative form of inquiry, we are beginning to see some of the weaknesses in our initial conversational method, weaknesses related to voice, language, and our ability to interact and establish trusting relationships, and weaknesses in our ability to understand complex, only partly constructed ideas and patterns. But we persist in the hope of understanding why teachers persist in engaging our children in environment-related school experiences. We persist by pushing along the edges of thought and practice, trying to "hear" and "see" more genuinely, more authentically as a result of our interactions and conversations. We persist not only because we want to understand what is going on but because teachers tell us that they are interested in learning more about what is going on here!

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Weatherizing Inner City Low Income Houses/Alternative Fuels Vehicle Expo

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Thirty students and twelve teachers from the Environmental Club and Advanced Environmental Photography Class at East Environmental Studies and Agribusiness Magnet High School in Kansas City, Missouri weatherized six low income houses in the Inner City of Kansas City, Missouri for an Energy Conservation Community Service Project from November 1994 to January 1995. Bob Hubert won the Excellence in Teaching Award and a $1,000 grant from the Kansas City Star Newspaper for organizing this project. This presentation gave information needed for anyone to set up a similar program.

The Students and teachers started their day with a weatherization training workshop led by Suzan Jackson at the Metropolitan Energy Center. Club members learned the correct way to chalk windows, put plastic on the inside of windows, put draft shields on doors and wrap hot water heaters with insulation.

The Metropolitan Energy Center gave the Club members all of the insulation materials they needed and six addresses to go to. The Club members spent the rest of the day weatherizing the six low income houses.

An Alternative Fuels Vehicle Expo won the State Energy Technology Education Award from the Energy Division of Missouri Department of Natural Resources. This presentation gave information needed to set up a similar program. East Environmental Studies and Agribusiness Magnet High School's Alternative Fuels Vehicle Expo was presented on October 19, 1994 and September 29, 1995 in Kansas City, Missouri.

The Alternative Fuels Vehicle Expo educated School students and staff about the importance of vehicles that operate on alternative fuels. Alternative fuels vehicles reduce air pollution, conserve natural resources, reduce our dependency on imported oil, provide more jobs, build our nation's economy, use surplus agricultural products for fuel and conserve energy.

The Expo has an electric car from Kansas City Power and Light, a propane car from Missouri Department of Natural resources, an ethanol car from Kansas Corn Growers Association, a compressed natural gas truck with a natural gas fueling station from National Fuel Systems, a compressed natural gas school bus from East High School, a compressed natural gas car from Missouri Gas Energy Company, a soy diesel truck from Missouri University at Columbia, a house weatherization and energy conservation display from Metropolitan Energy Center and a composting display from All Species Project.

Student-Produced Video Programs on Environmental Heroes and Heroines Broadcast over Local Cable Access Television

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Television: The Bad, The Ugly, and .....The Good?

In working to achieve environmental literacy and environmentally-responsible behavior, environmental educators need to address numerous institutions in our society—schools, the family, the community, religious organizations, government, business, interest groups/non-governmental organizations, and the media (Roth, 1992). Review of environmental education literature indicates that relatively little attention has been paid to the role of the media, even though print and electronic media help to shape peoples' beliefs, values, attitudes, and behaviors related to the environment (especially consumerism) to a great extent. Because of this influence, many people have become concerned about the concentration of power of the electronic and print media in a relatively few hands in the US in the past few years.

More particularly, people are concerned with television because of some of its negative impacts. Because of the hypnotic nature of TV, it has become an habitual time and space filler for many American households. Children watch TV 25 hours per week, and 20,000 commercials per year (Herman, 1991). It invites addiction and tears at the fabric of family life. T.V. increases passivity; Utne (1990) talks about the "pacifying effects of the electronic mind candy." Sobel (1993) points out that "television's capacity to evoke passivity and invite addiction can have a serious impact on the rich and fragile imaginative [lives or inner lives of children]." TV can limit children's active engagement and hamper the flourishing of children's active imaginations. Television news, presenting information which some children are unable to process, can create anxiety and fear and have an especially negative impact on the life of the imagination of children.

With shortened time frames, television gives people unrealistic expectations of how long and how complicated it is to work out real solutions in the real world. If presentation of graphic violence on TV does not directly cause violence, it certainly glamorizes violence, desensitizes us to violence, and stunts our empathy for our fellow beings.

Television can also perpetuate sex-role stereotyping. Commercial television encourages profligate consumption by glorifying rich lifestyles and by bombarding us with countless advertisements and commercials. Finally, it can be said that, in general, TV portrays the physical environment as there for us to use and exploit for our own personal gain without thought of future generations, other cultures, and other species.

In spite of all these deleterious effects of television, TV can also have some valuable or positive effects. We can use TV to enrich our lives and imaginations rather than being used by it and the culture of consumerism for which commercial television is a handmaiden, especially if we engage in conscious and deliberate television watching and analysis. Some have found it helpful to adopt guidelines such as: having clear limitations concerning the types of TV programs and the amount of viewing; having parents watch TV with their children and discuss what happens on the programs; and using the TV programs as starting points for children's dancing, singing, acting, etc.

In examining formative influences on environmentalists, it is interesting to note that some environmentalists did get turned on to nature and environmental issues or learned about environmental destruction through watching commercial television (e.g., Mutual of Omaha's *Wild Kingdom* with Marlin Perkins; Walt Disney shows on the desert, Antarctica, etc.; *National Geographic* specials) and public television specials such as *The Nature of Things, Nature, Nova, Earthkeeping, The Naturalists, Race to Save the Planet,* David Attenborough's *Life on Earth,* etc.

And because polls and studies show that a sizable portion of the American populace today is environmentally-conscious, network presidents are planning to start at least three 24-hour environmental cable channels—Planet Central, Ecology Channel, and Earth Television Network (Goldin and Motavalli, 1995).

Broadcasting Video Programs Produced by University Seniors over Local Cable Access Television

A specific approach which has the potential for having a positive rather than negative effect on the environment is local cable access TV. First, I should point out that we do not watch much television in our household, and when we do we try—not always successfully, I might add—to follow the guidelines mentioned above. Until about a year ago, I virtually never watched any of the local cable access television channels. I had the feeling that they were dominated by weirdoes and religious fanatics or supreme egotists who liked to promote themselves, and did not take them very seriously.

Then a friend who produces "Earth Matters," a monthly hour-long program on a local cable access TV station in Burlington, asked me to be a guest for his program on Environmental Education, and I agreed. The friend interviewed another guest and me for about 40 minutes, and then we fielded questions that were called in by viewers. At the time I was surprised by the interest of the viewers who called in and the quality of their questions. And in the week following the broadcast, I was overwhelmed by the number of people who told me they had seen me on the program—university students and faculty members, friends, school teachers, businesspeople, my barber, etc. This response caused me to reflect on the potential for cable access TV for environmental education and for grass roots citizen participation in democratic society. I called up the local cable company and found out about their policy for broadcasting locally-produced programs. In a short period of time, I arranged for the local cable company to broadcast programs on its local cable access TV channel that my students would produce the following semester.

Students in the senior-level capstone course for Environmental Studies majors and minors at the University of Vermont—working in teams of about 5 students each—served as "credible biographers" for local environmental heroes and heroines by producing videotape programs on their subjects and broadcasting them over local cable access television. The heroes and heroines are individuals or groups who serve as role models or examples for others to emulate in bringing about environmental change or living more sustainably; they inspire, encourage, and empower others.

At the NAAEE conference in Portland, segments of the student-produced video programs were shown. The topics included: environmental racism from the perspective of an Abenaki woman; environmental restoration; owner of environmentally and socially-responsible mail-order garden supply business; award-winning UVM recycling and composting program; solar home; electric vehicles; bird-on-hand program for school children using injured birds; school gardening program; demand-side management efforts by a public utility; organizing against toxic wastes in the community; Green Corps; etc.

The programs were generally positive, upbeat, featuring success stories. In many cases they considered people and topics the mainstream media would never touch. Many students commented that focusing on **solutions** to environmental problems offered an antidote to the feelings of despair, powerlessness, apathy, even paralysis they had felt from other classes which focused entirely on environmental **problems**. Most of the students said they were very pleased to have learned technical skills of videography and video editing—very useful skills for environmentalists to have—as well as skills of interpersonal communication and group dynamics—all in addition to researching the specific environmental issue(s) represented by the hero or heroine they met with, interviewed, videotaped, and wrote about.

The students gained very positive feedback from viewers. In letters and phone calls to the University, numerous viewers mentioned how impressed they were with the students' ability to find out about and celebrate unsung environmental heroes and heroines of northern Vermont. This, in turn, helped the students feel good from having shared with the larger community the insights and knowledge and skills they had gained from their undergraduate education in general and from working on this specific assignment for this specific course. For these students, it was not just learning for the sake of learning, but learning to communicate with and serve others and to work as change agents.

In seminar discussions at the conclusion of the semester, the students and I agreed that one of the features of local cable access television we considered especially significant was its potential to counteract the encouragement of profligate consumption through commercials and the glorification of environmentally-unsound lifestyles found on mainstream television stations. None of us considered environmentally-oriented local cable access television programs to be a panacea or cure-all, but they certainly did allow us the opportunity to experience one form of television having a positive experience on the environment and people rather than a negative experience.

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The Role of Mentoring in Environmental Education

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Mentoring In The Past

The term "mentor" has its origins in Greek mythology. Before the Greek hero Ulysses embarked on his epic explorations, he entrusted the education of his son Telemachus to his valued friend, Mentor. Mentor's task was greater than just formally educating the youth. He also served as a confidant and role model, providing ethical and character guidance. At critical times throughout the epic Athena, the goddess of wisdom, assumes the form of Mentor. "Thus, Mentor is both male and female, mortal and immortal—an androgynous semigod, half here, half there. Wisdom personified." (Daloz, 1986, p. 19)

The mentoring process itself may predate ancient Greece. Mentoring appears to be almost universal, with references to mentoring spanning a continuum from the Hebrew Bible (Carruthers, 1993) to children's literature and folk lore (Daloz, 1986), including:

- Moses mentoring Joshua in the Hebrew Bible,
- The Skin Horse in the Velveteen Rabbit,
- Charlotte in Charlotte's Web,
- Utnapishtim in the Gilgamesh epic,
- Gandolf in Tolkien's Hobbit Trilogy,
- The Spider Woman in Native American lore.

Mentor And Environmental Commitment

Research indicates that involvement and guidance from a caring adult, or mentoring, can play a significant role in development of a strong commitment to the environment. Tanner's (1980) study of formative life experiences among the professional staff of several environmental organizations found that respondents frequently reported the influence of adults, specifically parents (46.6%), teachers (31.1%), and other adults (26.6%). In a study of people of color working in environmental education and related fields, James (1993) found that 42% of the respondents indicated that a specific individual influenced their career path, again finding family members (24%) and teachers (12%) to be the most influential. Formal mentoring programs through environmental education agencies may provide connection to a caring and environmentally concerned adult to youngsters who do not have access to this guidance informally. Such programs may be very effective in promoting lasting changes in environmental attitudes and behaviors since "mentoring programs guide youngsters... as they encounter ethical situations in the outdoors" (Matthews & Riley, 1995, p. 40).

Several programs incorporating mentoring into environmental education can act as models for those interested in establishing a mentoring program. Mentoring programs within formal education have been established by Project Support of the Board of Cooperative Educational Services of Nassau County (BOCES) and One to One, a national mentoring program. Programs such as Nature Link, of the National Wildlife Federation, and The Conservation Career Development Program of the Student Conservation Association provide mentoring programs outside formal educational programs. In addition, one may be able to locate local mentoring programs through state mentoring associations.

The Mentoring Cycle

While the impact of mentoring can be life long, mentoring does not require a life long commitment. All mentoring progresses through a four-phase cycle (Kram, 1984) of initiation, cultivation, separation and redefinition (Table 1). Mentors and participants will need time to become acquainted and build trust between them, which is referred to as the initiation phase. Once a basis has been developed, the mentor relationship moves into the cultivation phase. Throughout this phase, mentors and participants interact and benefit from their relationship. The cultivation phase may last several months to several years, depending upon the program and participants. Eventually the dynamic between the mentors and participants will shift, possibly due to graduation and entering the work force, leading to a separation between the mentor and participant. Finally both mentor and participant will redefine their relationship, becoming acquaintances, colleagues or friends.

Table 1: The Mentoring Life Cycle

Definition

Initiation

The relationship begins and becomes important to both participant and mentor.

Cultivation

The maximum range of career and psychosocial functions are provided. Both individuals benefit from the relationship. Opportunities for meaningful and more frequent interaction increase. Emotional bond deepens and intimacy increases.

Separation

A period of a significant change in the structural role relationship and/or in the emotional experience of the relationship. Often occurs in conjunction with graduation or promotion.

Redefinition

An indefinite period after the separation phase when the relationship ends or takes on significantly different characteristics, making it a more peer-like friendship.

(Kram, 1984, p. 49)

Factors In The Premature Decline Of Mentor Relationships

Ideally a formal mentoring program will move both mentor and participants through the initiation stage to cultivation of the mentoring relationship, while also preparing them for the eventual separation and redefinition. Problems may arise within a mentoring relationship causing a premature end to the relationship. This is often due to problems between the mentor and the participant, such as:

1. Failure to communicate needs.
2. Failure to communicate goals.
3. Participant's failure to correctly assess mentor's intentions.
4. Emotional over dependence. (Zey, 1984, p.162)

Establishing And Maintaining A Mentoring Program

The success of a mentoring program may be determined by the level of preparation prior to implementing the program. An outline of the steps required to establish and maintain a mentoring program is provided below. Please note that the program described here is defined as one in which mentors are recruited and assigned to participants rather than a self-selection process.

Planning

1. Define carefully your objectives for the program and the role of mentors. Write a statement of purpose and long range plan that includes:

Who, what, where, when, why and how activities will be performed.
Input from originators, staff, funders, potential volunteers and participants.
Assessment of community need.
Realistic, attainable and easy-to-understand operational plan.
Goals, objectives and time lines for all aspects of the plan.
Funding and resource development plan.

2. Establish a set of written guidelines, such as a manual of information, for mentors. Give them as much information as possible to help them understand their role and what is expected of them.

3. Develop a recruitment plan for both mentors and participants. Include year-round marketing/public relations and a targeted outreach based on participants' needs. Be sure to include expectations, restrictions, benefits, and rewards.

4. Screen for mentors and participants with an application, face-to-face interview, reference checks and criteria to judge suitability for the program.

5. Provide training for mentors. The training should allow you to really get to know your mentors and answer their questions concerning the program and their responsibilities. Provide opportunities for mentors to "practice" some of the things they will be doing or talk with others who have been mentors. Provide skill development as appropriate. Go over any specific policies and procedures for safety, health, confidentiality, liability, and crisis management/problem solving.

Initiating

6. Provide large group social and recreational activities to introduce mentors and participants. An element of self-selection can be incorporated into a formal mentoring program by incorporating introductions by both mentors and participants into an initial large group event, and asking both mentors and participants to indicate who they would prefer to be their mentor or participant. Include periodic group recreational/social activities into the program to assist mentors and participants in moving from the initiation stage of mentoring into the cultivation stage.

Maintaining

7. Monitor mentoring aspects of program. Be available for questions and counseling if needed. Remember, a real mentoring relationship takes time—sometimes lots of time. Set up a monitoring process that includes consistent, scheduled meetings with staff, mentors and participants; a tracking system for ongoing assessment; written records; input from community

partners and families; a process for managing grievances, praise, interpersonal problem solving, and premature relationship closure.

8. Remember to support, recognize and retain by providing peer support groups, ongoing training and development, relevant issue discussion and information dissemination, networking with, other appropriate organizations, social gatherings, annual recognition and appreciation events, and newsletters or other mailings to participants, mentors, supporters and funders.

9. Allow for periodic evaluation with all those involved, and alumni of your mentoring program. Are needs being met? Is the program meeting its purpose and objectives? What can be done to improve program?

Concluding

10. Provide closure steps that include private and confidential exit interviews, clearly stated policy for future contacts, and assistance for participants in defining next steps for achieving personal goals.

Although many environmental educators have chanced upon mentors who guided them to their chosen profession, many of today's youth many not be granted the opportunities previous generations have accessed through informal mentoring. Formal mentoring programs may play an essential role in shaping the environmental additions and behaviors of the youth of tomorrow.

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Addresses Of Mentoring Programs:

Nature Link of the National Wildlife Federation, contact: Marilyn Emery, NatureLink Coordinator, National Wildlife Federation, 8925 Leesburg Pike, Vienna, VA 22184-001, phone (703) 790-4056.

Project Support of the Board of Cooperative Educational Services of Nassau County (BOCES); contact Laura Lustbader, Board of Cooperative Educational Service of Nassau County, Division of Instructional Programs and Services, Carle Place Center Concourse, 234 Glen Cove Road, Carle Place, NY 11514, phone (516) 877-1190.

Conservation Career Development Program of the Student Conservation Association (SCA); contact Benjamin Igartua Luke, Student Conservation Association, 1800 N. Kent Street, Suite 1260, Arlington, VA 22209, phone (703) 524-2441.

One to One, A national mentoring program; contact their national office: One to One, 2801 M Street, NW, Washington, D.C. 20007, phone (202) 338-3844.

Growth Management and Rural Land Use Decisions: Educating and Involving The Public

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Abstract

Using an issue book and video, facilitators will conduct an educational process for helping people and communities deliberate on rural land use issues. Modeled after the National Issues Forums, the process provokes deliberation on the values and consequences of alternative land management choices. The debate over land use is difficult because so many interests are at stake. This tool brings together audiences, often with conflicting ideas, to seek common ground for solutions to land use issues.

Land Use and the National Issues Forum Process

In an effort to make the land use issue accessible to widespread citizen discussion, a forum was created patterned after the National Issues Forums developed by the Kettering Foundation. Titled "Losing Ground: What Should We Do About California's Disappearing Rural Lands?" the forum encourages groups of people to think together about four broad policy approaches to dealing with this issue. Although modeled on California, the problem of disappearing rural lands is national in scope and the policy approaches have relevance in most communities.

Issues forums are designed to involve citizens in shared (i.e. public) recognition of the issue, in examination of the values that underlie the issue and in understanding of its consequences. Further, forums are structured to encourage thinking about the consequences of choices—the policy approaches to addressing that issue. 'Thinking' means recognizing and deliberating about the tradeoffs among equally valued but conflicting positions—both within one' s own value system and among those of many individuals. By listening to and talking with other citizens, participants in the forums engage in 'choice work' and search for common ground. The goals of public deliberation are clearly educative, both at the citizen and the community level.

The elements of a choice include a perspective of the problem, a sketch of a broad solution, specific policy options, critical facts, underlying values and motivations, and common criticisms of that approach. Each choice is understandable to an average citizen and easily illustrated by anecdotes describing familiar situations.

The Losing Ground Project

The "Losing Ground" framing committee was composed of Cooperative Extension faculty, a University historian and a staff researcher. The committee checked out the issue idea with a large advisory committee who believed the issue was useful and timely. During the ensuing year, members of the framing committee interviewed a total of thirty-three planners, developers, land owners, researchers and citizen activists from diverse backgrounds including agriculture, construction, conservation, and local government. Respondents were also chosen to represent different parts of the state.

Interviewees were asked to describe their vision of California in twenty years if current land conversion trends continue, their view of the seriousness of the land conversion problem, the type of land resource they were most concerned about, and their reaction to statements representing poles of opinion on the issue. The interview concluded with questions on the policy alternatives respondents thought most appropriate, and why.

Almost all respondents envisioned a scenario of continuous urban development from Los Angeles to San Francisco if the current rate of conversion continues—yet they differed widely in their concerns. Some respondents believed that the best use of rural land was to provide inexpensive sites on which to build houses. Some felt that preserving habitat, especially wetlands, in order to protect biodiversity was the most critical issue. Others projected permanent economic loss to the state from a decrease in the agricultural base; they saw the conversion of important agricultural lands as the loss of a non-renewable resource. Others feared that loss of open space, urban sprawl, and high costs of development will degrade the quality of life in California. Not only did respondents differ in their concerns, but they also varied widely in their understanding of the causes of rural land conversion and in their solutions.

The staff researcher analyzed and summarized transcripts of the interviews along with current literature on the subject. Framing committee members each clustered their perceptions of the problems and policy alternatives. These were posted and discussed by the committee. The committee arrived at four broad approaches, although not every solution or perspective could be included. This early version of the issue framework was tested at a land use conference and then run as a pilot forum with the full advisory committee for their critique. The refined framework became the basis of an issue booklet and video introduction.

A post-forum survey or "ballot" to be filled out by forum participants was also developed. This instrument contains questions that tap individuals' perceptions of the seriousness of different facets of the issue; their stances regarding trade-offs associated with each choice; their assessment of their own learning about the issue; their understanding of others' points of views; and what they think should be done about the loss of rural lands.

The Choices—Broad Policy Approaches to Rural Land Conversion

Each of the four choices, as summarized below, embodies a different take on the nature of the problem and therefore on the approach to the question of how citizens should deal with the state's diminishing rural lands. The choices are not necessarily mutually exclusive but are considered separately in forum discussions.

Choice #1: Encourage private responsibility for land conservation

Economic factors such as environmental regulations, individual indebtedness, increasing costs of production inputs and changing trade patterns leave land owners economically vulnerable. Reduced profitability and problems with succession compel landowners to sell their land for development. From this point of view, we can increase land conservation by adjusting our current market and regulatory systems. Simultaneously, we should create financial incentives for individuals to keep their lands rural. To support these measures we need a public education campaign for rural and urban residents alike that teaches appreciation of our rural land resources.

Choice #2: Establish permanent protection of "sacred lands"

A laissez-faire approach to land-use planning has brought the loss of farmland and habitat to the brink of a crisis. These lands are too important to be left to voluntary action and market forces. We now have a moral imperative to protect our land and biological resources. We need strong governmental action to preserve critical lands in perpetuity. We should inventory and prioritize our most valuable lands, supplement existing land protection tools with firmer and less vulnerable measures, and establish permanent growth limits.

Choice #3: *Diminish pressure for rural land conversion by enhancing urban life*

There is an adequate amount of land in and around cities for our housing needs without encroaching on new rural lands. It is cheaper to redevelop current urban areas than to build the infrastructure to serve new areas. However, deteriorating urban conditions and high costs of traditional housing have led people to seek affordable housing and a better quality of life outside our current urban centers. We therefore need to devote resources to improving the affordability and attractiveness of urban life—thereby discouraging people from developing more rural lands.

We should create policies that define urban limit lines, require more efficient use of land through inflow, increased density and redevelopment. Furthermore, we should make local government funding less dependent on property taxes.

Choice #4: *Centralize land use control under state or regional authority*

Land use decisions made at the local level have left our land resources vulnerable to short term interests, including changing political control and local fiscal necessities, creating a piecemeal approach to planning within arbitrary political boundaries. The problem is not what should happen to the land but who makes the decision.

This approach would shift the locus of control over land use decisions from local authority, which can be shortsighted and subject to political pressures, to a higher body responsible for long range planning. We need to transfer direct control over development and land use decisions to state government or a regional authority that can share data bases, establish overall long range policy and provide stronger mandates for resource protection at the ecosystem level.

The Forum Process

Forums are conducted by trained moderators or individuals with experience in facilitating groups in a process of deliberation. Moderators are neutral and have responsibility for leading the forum process. Ground rules are established by the group (i.e. listen fully, no interrupting). The forum is introduced as a process of deliberation, not a platform for debate .

A short video overview of the "Losing Ground" issue introduces the problems and choices. The moderator then introduces each choice and provides the group equal discussion time around the importance of the pro's and con's of the choice. The questions assisting the deliberation process seek to find the underlying values and personal feelings associated with each choice. Time limitations maintain a balanced consideration of all perspectives.

After discussion of the fourth choice, participants are asked to reflect on the public deliberation they have just experienced, to identify what they perceive as 'common ground' emerging from the deliberation. Typical questions used to elicit ideas include the following:

- What was different in this forum from other political discussions in which you have participated?
- What values do participants in this forum share?
- What consequences of the choices discussed could participants not live with?

- What did you hear people say they could live with even if it weren't their preference?
- What issues were unresolved?

As comments are offered, participants may challenge a statement that they feel does not reflect what had been said during the forum. A recorder captures statements on newsprint which reflect consensus. Before participants leave, they are asked to complete and leave behind a 'post-forum ballot.'

Issue Forum Information

For a copy or rental of the video tape "Losing Ground" or for copies of the issues books titled "Losing Ground: What Should We Do About California's Disappearing Rural Lands?" Write Rural Lands Project, Applied Behavioral Sciences Dept., UC Davis, Davis, CA 95616.

For information on National Issues Forum moderator training programs and support materials, contact the National Issues Forum, Kettering Foundation, 200 Commons Road, Dayton, Ohio, 45459-2799 or call (513) 434-7 300 .

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Undergraduate Environmental Science in Bangladesh

Cub Kahn

Dutchess Community College, State University of New York

In 1993, the newly established Independent University, Bangladesh (IUB) in Dhaka launched the country's the first bachelor's degree program in environmental science and management. IUB was founded by the Education, Science, Technology and Cultural Development Trust, a Bangladeshi nonprofit, philanthropic organization based in Dhaka, and the founding president of IUB is Dr. Majeed Khan. IUB's stated mission is to contribute to sustainable economic growth in Bangladesh by providing higher education that meets international standards.

The university began to matriculate undergraduate students and offer coursework leading to Bachelor of Science (B.Sc.) Honours degrees in 1993. The faculty, staff and student body of IUB are predominantly Bangladeshi. The author of this paper taught as a volunteer at IUB during the 1993-94 academic year and again during the 1995 summer session, and is now acting as an American liaison for IUB.

The Context

Bangladesh, one of the world's poorest and most densely populated nations, suffers from a panoply of severe environmental problems including cyclones, monsoon flooding, inadequate sanitation, unsafe drinking water, severe overcrowding in slums and squatter settlements, water rights disputes with neighboring India, deforestation, and minimal industrial pollution control. Globally, there is no precedent for so many people—120 million—living in such a small land area (equivalent in size to New York state). Bangladesh's environmental dilemmas are exacerbated by rapid population growth and explosive urbanization as landless villagers migrate to the few large cities in conjunction with the nation's industrialization.

Bangladesh has a history of sending many of its best students abroad to the United Kingdom, United States, India or elsewhere for higher education; many of these students permanently relocate in other countries. The development of an environmental curriculum at a domestic university is essential to prepare environmental professionals to deal with Bangladesh's burgeoning environmental problems.

Curriculum Development

The IUB environmental curriculum was created through the efforts of numerous faculty members, consultants and the 17 members of the university's International Advisory Panel, which includes representatives of universities and nongovernmental organizations in Belgium, Canada, France, the Netherlands, the United Kingdom, and the United States. Realizing the importance of international linkages in higher education, IUB has signed an agreement with the Free University, Brussels for faculty and student exchange, and is negotiating a number of similar agreements with other universities abroad.

IUB's B.Sc. Honours programme in environmental science and management was designed to provide focused interdisciplinary study in the natural and social sciences for students planning to go on for graduate studies in environmental disciplines, as well as for students preparing for environment-related careers in industry, government, nongovernmental development organizations and consulting. The four-year curriculum, based on the American credit-hour and semester system, was developed to provide students with the analytical and communication skills, theoretical knowledge, and understanding of societal issues to function within Bangladesh's complex ecological and socioeconomic framework and to deal effectively with their country's pressing environmental and human development concerns.

The Curriculum

The IUB environmental science and management curriculum requires satisfactory completion of 120 credit hours, typically spread over 8 semesters of full-time study. English is the language of instruction. The program requirements include:

A. 35 credit hours of **foundation courses** including English skills, computer skills, mathematics through calculus, physics, introductory environmental sciences, national culture and heritage, and an intensive inter-term live-in field research experience.

B. 54 credit hours within the **environmental science and management major** including:

  (1) 24 hours of **core courses** including environmental chemistry; environmental biology, ecology and conservation;
  environmental economics; geographic skills (remote sensing, cartography and geographic information systems); public relations in environmental management; probability and statistics; and social science research methods.

  (2) 18 hours within an area of **concentration**, either population and environment or general environmental management.

  (3) 12 hours in a semester-long **internship**, a **senior thesis**, or a semester of **study abroad**.

C. 15 credit hours in a **minor** such as business management, computer science, or development communications.

D. 6 hours in a **second international language**.

E. 10 credit hours of **electives**.

The Future

IUB's first graduates will be completing their B.Sc. Honours degrees in 1996 and 1997. At present the university is developing other areas of concentration within the environmental science and management program, and is beginning to outline a graduate-level program in the environmental sciences.

Environmental Education and Conflict Resolution

Mary Jo Larson
Peace Corps, Washington, DC

In May of 1993, ninety Peace Corps volunteers, environmentalists, and local educators attended a teacher training workshop in Harare, Zimbabwe. Using environmental themes, they developed strategies to improve the English language and critical thinking skills of rural secondary school students. One of the models constructed during the workshop was community decision making, a process to introduce students to conflict resolution strategies while addressing a local environmental issue: elephant management.

Elephant management is a complex issue in Zimbabwe. The government has set aside over 12% of its total land area for national parks, and elephant populations have increased rapidly in these protected areas. According to the Ivory Trade Review Group (1993), Zimbabwe's elephant populations have grown to over 50,000. At times, elephants roam out of the national parks, which properly sustain up to 35,000 elephants. In the rural communities, elephant herds can be very destructive of farms and woodlands. This issue has economic relevance to rural Zimbabweans, particularly those living near wildlife parks. Whereas wealthy foreign tourists and international environmental organizations describe elephants as endangered species, many poor rural families in southern Africa view the elephant as an abundant natural resource that can provide food and the income to pay for other necessities, such as school tuition.

Community decision making was designed to provide a learner-centered experience to students accustomed to traditional "chalk and talk" lectures about academic topics. Placed in cooperative learning groups, the students address a "real life" issue. Each participant at the community meeting is given a description of his or her role and interests. The parties are given instructions that outline a joint problem-solving process and clarifies the elements of relationship building. Small groups try to reach a consensus within the prescribed period of time.

This cooperative learning activity draws on a synthesis of constructivist and conflict resolution theory. Learning has no prescribed "rightness" or "wrongness." It is socially and culturally mediated, and non-objective. Participants search for meaning by addressing relevant issues, identifying key questions, and generating their own solutions. As the scenario evolves, learners begin to understand a problem from different points of view. While negotiating with each other throughout the meeting on elephant management, for example, the participants learned about the interests of (1) a rural community, (2) the tourist industry, (3) government agencies, (4) local environmental NGOs, or (5) international environmental NGOs.

The community decision making model developed in Zimbabwe can be modified to help students address critical issues in any urban, suburban, or rural environment. Students might decide to conduct research and participate in a problem solving meeting to address coral reef destruction, urban migration, deforestation, HIV/AIDS, girls' education, sexual harassment, or substance abuse. To introduce this conflict resolution process, teachers must be willing to allow students to brainstorm and analyze without offering solutions or giving judgemental feedback. This model allows students to become creative problem solvers as they take responsibility for addressing their own concerns. While talking about their school or neighborhood, students are taught to express their points of view freely, but respectfully. Community decision making is a joint problem solving process that helps learners to:

- Identify and prioritize common problems or issues,
- Identify key parties and decision makers,
- Conduct research to understand concerns and interests,
- Share strategies and generate non-violent alternatives,
- Analyze and prioritize possible solutions, and
- Negotiate and persuade to reach a group consensus.

Community decision making enhances the benefits of cooperative learning by introducing conflict resolution strategies. While developing their English language, critical thinking, and social skills, students are reminded that successful consensus-building requires patience, respect, and creativity. As they construct new solutions to complex problems, students explicitly address four of the key elements that affect the success of working groups: *purpose, roles, rules*, and *relationships*. Using Bernice McCarthy's 4MAT model for lesson planning, community decision making might include the following steps:

MOTIVATION

- Class discussion of a current issue. How do people solve problems?
- Teacher explains **purpose** of lesson—to participate in a community decision making meeting to try to solve a common problem (issue).
- Generate issues by brainstorming about school problems, letters to the editor, community discussions, etc. (Think-Pair-Share or Journals)
- Allow students to prioritize issues and choose the most critical. (Vote!)
- Brainstorm—who are the major parties with an interest in this issue? Who are the decisionmakers?
- Use a word web/graphic organizer to note key parties.
- Students choose **roles** and prepare to represent the interests of the major parties. (See examples below.)

INFORMATION

- Students conduct research, including interviews, to find out more about the issue from the perspective of their role.
- Students discuss interests in group representing the same role.
- Students summarize analyses and submit opinions and rationale to teacher.
- Teacher explains the community decision making process.
- Teacher dictates the five steps in the process (**rules**).
    1. **In turn, explain your positions.**
    2. **Identify and record major problems.**
    3. **"Brainstorm" to suggest solutions.**
    4. **Write down possible solutions.**
    5. **Come to a consensus.**
- Teacher and students discuss values, attitudes, and behavior necessary for good working relationships.

PRACTICE

- Teacher reminds students of values, attitudes, and behavior necessary for good working relationships.
- Community leader reminds participants of process and purpose.
- Students participate in community decision making meetings, sharing interests, and generating non-violent solutions to problems.
- Students analyze and prioritize possible solutions.
- Students negotiate and persuade to reach a group consensus.

APPLICATION

- Students present the consensus of their group to the class.
- Students in class classify options generated by groups.
- Whole class votes on possible solution.
- Students write letters to editor (or articles) with their own opinions and recommendations.
- Publish letters. If possible, create a newsletter.
- Illustrate message with drama, song, poetry, ETC.

Community decision making is a conflict resolution process that helps students to develop the knowledge, skills, and attitudes required to participate in a non-violent democratic society. As responsible community members, they analyze, articulate, and defend their own points of view. They learn to listen actively, challenging each others' ideas and working together to seek new solutions. Throughout the process, learners are developing a greater understanding of the key elements that lead to successful cooperation, including patience, respect, open mindedness, and creativity. While addressing critical community issues, teenagers may even become the heroic constructivists of long-sought-after solutions!

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Peace Corps and Environmental Education

Mary Jo Larson
Peace Corps

Throughout the world, Peace Corps is infusing Environmental Education in school-based projects. This presentation will provide an overview of Peace Corps activities in Asia and the Pacific Region and demonstrate experiential learning strategies that Volunteers use to help students develop the knowledge, skills, and attitudes to promote sustainable development in their schools.

Objectives

- Explore the role of Peace Corps Volunteers addressing local environmental issues in Asia and the Pacific Region.

- Share experiential learning strategies used to integrate environmental education in the curricula in Zimbabwe.

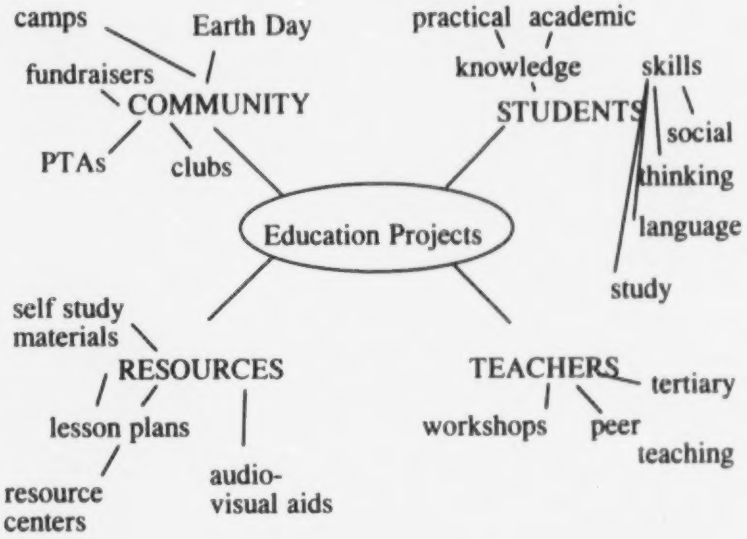
Environmental Education in Asia and the Pacific

Peace Corps Volunteers in Asia and the Pacific Region serve in communities stretching from the Himalayas to the island nations of the Pacific. The nineteen countries served by these Volunteers face a host of environmental problems, including waste management and destruction of unique and fragile ecosystems. Unsustainable practices caused by population growth and modernization threaten the ecological balance and intensify development problems related to health and economic growth.

Peace Corps' environmental education strategy is to focus on natural resource protection and sustainable development practices. Increasing attention is being placed on youth and women, with greater consideration of the need to identify and support sustainable income-generation options. Volunteers assigned exclusively to environment sector projects focus on forest, parks, and water management and involve communities in environmental education activities. In Nepal, Volunteers work with counterparts to increase the capability of local forest users, especially women, to manage resources in a sustainable manner. Volunteers in Thailand help to develop quality park interpretive programs in terrestrial and marine parks and to plan and develop education and wildlife research programs. In the Philippines, Volunteers assist provincial and municipal governments in alleviating poverty by promoting development and environmental activities in agricultural production, coastal resources management, and health and sanitation education.

Volunteers assigned to education projects are contributing to sustainable development by infusing environmental themes in school-based programs. Environmental-based teaching is used to promote discovery learning, critical thinking, and cooperative problem solving.

In keeping with the 1990 *Education for All* Conference in Jomtien, Thailand, these Volunteers are working in schools to help students, teachers, and communities to make education more relevant to social needs.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Earth Day
fundraisers
COMMUNITY
PTAs
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STUDENTS
social
thinking
language
study
Education Projects
self study materials
RESOURCES
lesson plans
resource centers
audio-visual aids
TEACHERS
tertiary
workshops
peer teaching

Peace Corps
Education for Development

In Fiji, education Volunteers and their counterparts are involving students and their communities in projects to assess renewable energy resources, deforestation, and coral reef destruction. Volunteers and their counterparts in Tonga have established an environmental committee named *Tonga Island Watch* to involve youth in tree planting, beach cleanup, and developing an interpretive center. In Western Samoa, environmental education projects have included proper rubbish disposal, erecting embankments, and growing trees on eroded slopes. In Micronesia, Volunteers and their counterparts are incorporating environmental planning strategies into school lesson plans. In Palau, school libraries have become centers of environmental education activities and displays.

Interest in promoting environmental education through teacher training continues to gain momentum throughout the Region. Educators in Micronesia, Fiji, Kiribati, Marshall Islands, Papua New Guinea, Palau, the Philippines, Thailand, Tonga, Solomon Islands, and Western Samoa have requested and participated in Peace Corps in-service workshops designed to integrate environmental themes into the school curricula. These workshops inspire school-based projects and activities—environmental education camps, science fairs, and environmental clubs—which involve students and their families in projects that address local development issues. The Region is currently planning support for environmental education in China, Nepal, and Sri Lanka and anticipates that environmental education components will be infused in 90% of Asia and the Pacific's country programs by 1997.

Peace Corps is able to bring together a community of individuals with a wide range of technical expertise—from agriculture and youth conservation to health and small enterprise development. With the government and non-government partnerships developed throughout Asia and the Pacific, Peace Corps will continue to improve the quality of all efforts that strengthen environmental protection and sustainable development practices. The many perspectives and the lessons learned have benefits that extend beyond environmental activities in the Region. As Volunteers return to their homes in the US, they bring to their communities the understanding and skills gained through their environmental education experiences with families, communities, and organizations throughout Asia and the Pacific.

Understanding Global Environmental Change

Betsy A. Leonard

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Introduction

The study of global environmental change is difficult because it utilizes information and ideas from many other subjects—from science to politics, from economics to culture.

Recent accounts of the scientific debate on climate frequently misrepresent what is in question. The reports suggest that scientists are still discussing whether or not the climate is changing in response to greenhouse gas emissions. However, in most scientific circles the issue is no longer whether or not greenhouse-gas-induced climate change is a potentially serious problem. Rather, it is how the problem will develop, what its effects will be, and how these can best be detected.

Natural Climate Variability

The Earth's climate has not always been the same as it is today. There have been times in the geological past when the global climate was warmer or colder than at present. This fluctuation in climate is known as natural climate variability. The climate system is complex. It is governed not only by what happens in the atmosphere, but in the oceans, the cryosphere (glaciers, sea ice, and continental ice caps), the geosphere (the earth's solid surface), and the biosphere (living organisms in the oceans and on land). The interactions among these various "spheres" are difficult to predict, in part because their respective processes occur on widely differing time scales, ranging from a single day to millennia.

Natural causes of global climate change result from 1) internal Earth processes, such as plate tectonics and volcanoes; 2) processes external to the Earth, such as changes in the amount of solar radiation received; and 3) catastrophic events, such as large meteorite impacts. There are many different methods and techniques used to study past climates. Some of these techniques include studying characteristic sediment and rock types, the use of pollen spores, evaluating air bubbles trapped in glacial ice, the distribution of wind-blown sediment, variation in the thickness of tree rings, glacial erosional and depositional landforms and the evaluation of stable carbon isotopes in fossil organic matter.

Even with the use of General Circulation Models (GCMs), computer models which scientists use to replicate present climate conditions and predict future changes, there is much uncertainty. Some of the questions which scientists are working to resolve include the role of clouds (will they enhance or mitigate global temperatures), the role of ocean circulation (the upwelling of deep ocean currents and the impact of thermal expansion), the role of the entire carbon cycle (only about half of the carbon cycle is known), and the role of the polar ice caps (will melting increase fresh water or lead to sea level rise).

Global Warming/Greenhouse Effect

Intricately involved with resolving these issues is the role of the greenhouse effect. Greenhouse gases are natural and, if absent, the earth would be 70°F colder. The more the greenhouse gases block the reflected infrared radiation, the warmer they keep the surface. So, if more of these infrared absorbing gases are added to the atmosphere, the greenhouse effect increases and warms the world still more.

Global temperature is today 0.3–0.6 degrees Celsius above what it was in 1880. Warming over the next fifty years may be comparable to the warming that occurred following the last Ice Age. The ten warmest years ever recorded have all occurred since 1980. There does not appear to be any other time when such a rapid change occurred over a period of only 100 years. Most climatologists believe that the warming trend will continue in response to the continuing buildup of greenhouse gases in the air, particularly carbon dioxide (CO_2). It is less clear exactly when this will happen and how much change will occur.

Accelerated global warming would have a variety of impacts, though how much each part of the earth will be affected is difficult to predict. It is projected that warming will be greater on land than in the oceans. There will be a greater emphasis of warming in high latitudes than at the equator and warming will be greater in the winter than in the summer. The consequences of higher temperatures are greatest for agriculture, forests, fisheries and cities, particularly those in coastal areas. Global warming would cause thermal expansion of ocean waters and the melting of some polar ice. Local climate patterns would be altered which could lead to the fragmentation and destruction of many ecosystems. Additional stresses would be placed on the global agricultural system, already struggling to meet the needs of a skyrocketing human population.

It is important to acknowledge what scientists know and what they are unsure about. There is no doubt of the natural greenhouse effect. It is confirmed that the earth has warmed about 0.6 degrees centigrade over the last century. Does this prove human induced warming? No. Is the warming consistent with the predictions of models for the rate of warming? Yes. Is the warming consistent with natural variability over large time scales? Yes, but barely. Most scientists are conservative and will not formally say that global warming is human induced. However, scientists do admit to the increase of climate gases. They know these gases are human caused and trap heat which will lead to increased global warming. It is known that CO_2, primarily caused by high emissions of fossil fuels, has been and will continue to be a major greenhouse gas. Lastly, most scientists acknowledge that a large reduction in CO_2 emissions is necessary. The recommended amount is a 60% decrease of CO_2 from 1990 levels.

Ozone Depletion

The delicate balance of the gases that make up the atmosphere allows life to exist on earth. Ozone depletion and global warming are related to changes in the concentrations of these gases. About 99.96 percent of the total mass of the atmosphere is due to the presence of three major permanent constituents: nitrogen (N_2), oxygen (O_2), and argon (Ar). Water vapor (H_2O) is an atmospheric gas with a variable concentration. The remaining constituents of the atmosphere are trace gases such as ozone (O_3), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), chlorofluorocarbons (CFCs), and halons (brominated CFCs).

The development of the atmospheric ozone layer had a very significant impact on the evolution of life on this planet. Once atmospheric ozone developed, life was protected from damaging solar ultraviolet radiation. Ozone (O_3) is composed of three oxygen atoms. Most ozone is located in the stratosphere, a layer of air between 15 and 50 kilometers above the Earth's surface. Ozone in the stratosphere is life-protecting, whereas ozone at ground level or in the troposphere is a damaging part of photochemical smog. Human activity has lead to a decrease in stratospheric ozone and an increase in tropospheric ozone. There is evidence of a thinning atmospheric ozone layer in every latitude during every season. However, the most dramatic loss occurs at the start of spring in the Southern Hemisphere. The area of the Antarctic ozone "hole" is about the size of the continental United States and continues to grow larger each year. As ozone decreases by 10 percent, there is a 20% increase in UV-B radiation reaching the ground. This poses a direct threat to the natural world who do not have the option of undertaking protective measures.

Decreases in stratospheric ozone are directly attributed to the chlorofluorocarbons, CFC-11 and CFC-12. Sources for these chemically inert gases—that is, they do not combine readily with other chemicals nor are they easily soluble in water—include use as propellants in aerosol spray cans, use as refrigerants in home and automobile air conditioners, and use in the manufacturing of polyurethane and polystyrene foams used in home insulation, as well as in polymer foams included in furniture and car seats. Emissions of chlorofluorocarbons were not present in the atmosphere before their invention in the 1930s. Chlorine and bromine are released into the atmosphere from CFCs and halons through a series of catalytic reactions. Both of these chemicals serve as catalysts and have a remarkable capability for destroying ozone.

Most of the effects of changing ozone levels can be classified as either biological or climatological. An increase of solar ultraviolet radiation can damage the human immune system, cause increased skin cancers and radiation blindness, reduce crop yields, disrupt marine food webs by adversely affecting plankton, and cause significant climate change. There is currently great danger from ozone damage but the risk may modify in 50–100 years if the world's nations continue to comply with the Montreal Protocol, a commitment to the elimination of CFC production and use by the year 2000.

Conclusion

The world is an interconnected system. The four principal components of the ecosphere under threat are the climatic system, the nutrient cycles, the hydrological cycle, and biodiversity. Overpopulation and waste are the two biggest problems facing this generation. All other issues stem directly or indirectly from these two problems. Social responses must be based on where the human species is headed, not based on today's perspective. The main question facing the human species is how to implement strategies for sustainable development. Despite much uncertainty, the one thing that is assured is that the next twenty years will herald incredible and profound change.

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Local Discovery, Global Understanding

Luis Malaret and Douglas Potter, Judith Cradler
New England Science Center, Worcester, MA (1 and 2)
The A.L.L. School, Worcester, MA (3)

Introduction

Science education is changing in two significant ways. First, it is becoming transdisciplinary. Second, more emphasis is being placed on group solutions to open-ended questions that are inquiry based and relevant to students' interests (National Research Council 1994, Massachusetts Department of Education 1994). We present a project embracing the above two changes in science education to develop a science curriculum for ninth graders.

General Goals

The goals of the project were to develop:

- a transdisciplinary ninth grade science curriculum using global processes as its conceptual foundation and student questions to guide it;
- a model of collaboration between public schools and informal education.

The Institutions

This project involved the A.L.L. School and the New England Science Center (NESC), both located in Worcester, MA. The A.L.L. School or Accelerated Learning Lab is a project-based urban public school, which focuses on global studies. It is part of the Co-NECT School project developed by Bolt, Beranek and Newman, Inc.

The NESC's mission is to excite and educate about earth's dynamic nature, and about the interconnectedness of humans to the larger environment. The Center contains a wildlife center, exhibits on the earth's dynamic nature, and presents multi-media environmental education programs.

Institutional Arrangements

The A.L.L. School was responsible for curriculum content and evaluating the students. The NESC provided programs and resources as needed. Each week students spent three days at the A.L.L. School and two days at the NESC.

The curriculum content was determined by educational guidelines which stipulated an emphasis on astronomy, including the solar system and the universe, earth's atmosphere, including weather, and earth's surface, including plate tectonics and volcanoes (Table 1). A strategy which would encourage the students to ask questions was developed for introducing the students to this curriculum.

The Comet Crisis

In order to gain the students' interest we created a "real" problem by simulating a "emergency scenario" based on the Schumacher-Levy 9 comet. Using the NESC's telecommunication facilities, we combined taped scenes of the National Oceanographic and Atmospheric Association (NOAA) headquarters and photographs of the Schumacher-Levy 9 comet, and dubbed over our own message. Suddenly, while the students were in the telecommunications room, the three large screens came to life and an "emergency" announcement was broadcast. The announcement stated the following:

A news alert from NOAA informs selected institutions that a comet, in completing its orbit around Saturn, was caught by the gravitational pull of the planet and was shattered into 42 pieces. It was estimated that these fragments, the largest being ten miles in diameter, were on a collision course with Earth. It was estimated that they would strike the Earth on September 11, 1995. Students were informed that it was too early to estimate the exact points of impact and /or if the fragments would hit the Earth. All groups hearing the announcement were requested to develop plans to deal with the emergency.

After receiving the news flash, students reacted with a high degree of emotion and excitement. We divided them into small groups to discuss the situation and to develop questions to help solve the crisis. At this point students were told that the scenario was a simulation. Some students stated that they had identified clues suggesting a simulation. Most said that the simulation had worked because it "forced them to focus on the problem". Most agreed that if they had known that the presentation was fake, they would have treated it as a game or even a joke. However, a few students were very upset and would have preferred to know ahead of time. Anyone attempting this type of activity in the future must carefully examine this aspect. The teachers compiled the student questions (Table 2) and developed five project paths for the students to explore: Comets, Asteroids and Meteors; Observation Technology; Orbits; Tunguska; Global "People" Issues.

The students worked on their topics for several weeks. In November they presented their findings and stated what action they would take to deal with the crisis. The reports provided only general information while the recommendations were very specific - not the direct result of the students' research efforts. There was a distinct separation in the students' minds between the general information they had been required to gather for the report and their own opinions concerning the comet crisis.

The separation of report and recommendations was due to two factors:

* The process of taking the students' questions and placing them into path topics had transferred ownership from students to teaching staff. Thus, students followed the teachers' preferences and not their own.
* Four of the project paths were very general and unwieldy. The other was too specific with little available information.

The Response to the above Assessment of the Comet Crisis

In response, the project staff decided to put a local focus on the next student projects and have them examine the 60 acres of woodland and meadow surrounding the NESC. Borrowing from previous educational efforts (Bless 1994) we set up a natural history study in which pairs of students selected and marked off a 10 x 10 meter quadrat.

The following process was used to give students more control over the research topics they would investigate: (1) Each team developed five questions while in their quadrat, (2) All questions were compiled and examined by all teams, (3) Each team chose one question they found particularly interesting, (4) In discussion with an instructor, they selected the general topic they wanted to investigate (Table 3), (5) Each team made a list of in-depth questions related to this general topic (Table 4), and (6) They selected one question to investigate first (Table 5).

The Content - 9th Grade "Earth Science"

As the students began to investigate their quadrats, we were faced with responding to the required content of 9th grade science as outlined by the city of Worcester. As shown in Table 1, this content is typical earth science; biology is peripheral. Our objective, however, was to develop a transdisciplinary science curriculum focused on understanding the interconnected and dynamic nature of the earth, including the role of life. This dynamic model of energy and matter cycles between the atmosphere, lithosphere, and biosphere - a model of interaction between the biological and the physical is diagrammed in Figure 1. In essence, our primary goal was to indicate the role of life, including the students' lives, in the dynamic processes of the earth. In this way, biology, rather than being peripheral, is the foundation of our transdisciplinary science investigation of the environment. Accordingly, we adjusted the content to reflect this dynamic nature of the earth and the role of life in these processes as shown in Table 6.

The Process - Curriculum Structure

Ours is a constructivist approach to education, one which allows the asking of questions, responds to student needs and interests, as well as introduces the above content. Thus, ours is a flexible curriculum consisting of the quadrat study (the doing of science) at the core, sandwiched by Topical Presentations and Skill Workshops (Figure 2). As shown in Table 7, the Topical Presentations were designed to introduce the students to the content outlined in Table 6. Our approach was to focus on the transdisciplinary causes of environmental change on the earth. Our intent was to give the students ideas to play with, to expand their investigation from the local to the global, and also remain flexible to respond to their ongoing investigation in the field. The Skill Workshops as outlined in Table 8 were intended to give the students the means of doing their investigations in the field, the means of effectively participating in the scientific process. This structure allowed for the introduction of science content as well as the doing of science via study in the field and the introduction of environmental/social issues.

We also assigned homework. These consisted of reading articles from magazines such as "Natural History," related to the interests of the students. For example, several students were interested in parental care. Their model of parental care, however, was that of humans. They asked - why do some animals lay eggs and leave? Is this abandonment? Are they bad parents? We had them read an article on Garibaldi Fish entitled "Honey, I Ate the Kids," to stimulate and expand their thinking on this subject (Sikkel 1994).

The Quadrat Study

The quadrat study was the core of our educational model. It was an opportunity to have the students do science in the field while making connections to the global environment via the Topical Presentations. We believe that the environment offers an opportunity to not only investigate science content as well as do science, but also is a good way to begin to understand earth processes, the interrelationship of various earth systems - in other words, transdisciplinary science.

The quadrat study was also an opportunity for students to ask questions, to own the process of learning—the constructivist model of learning. Our goal was to keep ownership of the investigation with the students, to not force the students into specific project paths, as was done with the comet crisis. A problem, however, was the unwieldy nature of having students pursue such a large number of subjects. It soon became unmanageable. We decided to form the students into four groups around core subjects related to their interests - Plants, Invertebrates, Vertebrates, and Stream Ecology. The plant group surveyed the flora found at the NESC. The invertebrate group surveyed the invertebrate fauna in the soil and leaf litter. The vertebrate group surveyed the vertebrate fauna found at the NESC. The stream ecology group focused on aquatic invertebrates as well as the physical composition of water at the NESC.

As in the real world, and because this was a class endeavor, we convened conferences to share information between groups. In addition, each group met periodically to review results, discuss further investigation, and assign tasks. There was a final presentation/conference in which the students used multimedia to present their data and conclusions of this scientific investigation to the public, including the A.L.L. School staff, the NESC staff, and parents.

Conclusion

The students' ability to develop interesting, and in many cases sophisticated, questions was clearly demonstrated during the year. This process permitted the students to participate in directing their learning and also gave the instructors an insight into the students' interests and concerns.

To make an inquiry-based curriculum work, ninth graders cannot have a half year project given to them. The projects must include short term goals so the students see an end to their efforts, with an assessment, and a new project beginning, so they can utilize the newly learned knowledge and techniques, and effectively integrate them into a new investigation. For example, the long term focus of the Quadrat Study could have been one solution to the problem raised in the first semester, that of creating an artificial environment on another planet if earth was destroyed by the comet. This would have helped students direct their individual investigations and create short term investigations. Each team would need to know if the organisms they were studying were required in the new environment. In turn, they would need to know how the organisms live, if there are other organisms that depend on them and visa versa, the roles they play in the larger ecosystem, etc.

The quadrat investigation of the local environment, combined with the Skill Workshops and the Topical Presentations focused on global environmental change, allowed the students the freedom to ask and explore individual questions as well as recognize the role of life, including their own lives, in the processes of a transdisciplinary, dynamic earth.

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National Research Council. 1994. *National Science Education Standards. Draft Discussion Summary*. National Committee on Science Education Standards and Assessments.

Sikkel, Paul C. 1994. Honey, I Ate the Kids - For garibaldi fish, devouring their offspring is not always a bad thing. *Natural History*, Volume 103, Number 12: 47-50.

EARTH SCIENCE - Biology introduced where possible.

PLANET EARTH
Crust; Rocks/Minerals; Oceans; Geology/Fossils; Location/Time/Size/Shape/Maps

EARTH'S CHANGING SURFACE
Plate Tectonics/Earthquakes; Volcanoes; Plains/Plateaus/Mountains; Weathering; Erosion—Water/Ice/Wind/Sand

EARTH'S ATMOSPHERE
Air—Composition/Water/Temperature/Pressure/Moisture; Wind/Weather—Climate/Seasons; Air Mass / Weather; Air Pollution

UNIVERSE
Astronomic Instruments; Stars/Galaxies; Solar System; Planets/Asteroids/Comets/Meteoroids; Moon—Eclipses/Tides; Space Programs Exploration

Table 1. Required 9th Grade Science Content as Outlined by the City of Worcester.

Nature of the Comet
What is a comet?
Could it burn up in our atmosphere?
What would happen to the comet pieces after they hit?
What is the overall affect of a comet?
What does sublimate mean?
Which piece of the comet is the biggest?

Its Effect on the Earth
If it hits, will we die?
Will it cause air pollution? How much?
If it hits the earth, where will it hit?
If it hits part of the earth, would it affect another part of the earth?
Will it hit ocean or land, and what is the difference in impact?
How much impact does a comet have?
What happens if you are in an airplane when the comet hits?
If the comet hits the earth, how will it effect the air?
Is it possible for only x amount of people to survive?
How many of the 42 pieces will hit?
Could the comet change the earth's orbit

What can We Do?
Is there any other place to go?
What is the government's obligation?
Given the crisis, can we guarantee the cooperation of all countries on earth?
What should we do - destroy the comet, protect ourselves?
Can we stop the comet with a nuclear device?
Can we survive a nuclear winter?
In case of a nuclear winter, do we have the technology to survive?
Are there any precautions we could take?
Can we change the earth's gravitational pull?
Can it be blocked by another planet?
Is it possible for the earth's orbit to move out of the way of the comet?
Is it possible to make the earth go faster?
Could we cut a hole in the space/time continuum and what would happen?

Table 2. The students' questions on the comet crisis.

Moss
Animal Behavior-Parental Care (Eggs)
Electromagnetic Waves in the Environment
Leaf Litter Organisms
Insect Eggs
Quadrat Species
Reptiles and Amphibians-Habitat
Interaction Between Plants and People
Impact of Train on NESC Environment
Animal Behavior-Social (Mammals)
Color in Animals
Color in Trees
Camouflage

Table 3. The topics explored by quadrat teams.

Topic: HUMAN IMPACT ON THE ENVIRONMENT

TYPES OF HUMAN IMPACT
- Does walking affect the environment?
- By people affecting animals, do they affect the environment?
- Do humans check the ground to start building?
- What is the impact of having the grounds crew snip branches off?

THE TRAIN
- How far from the train tracks is the environment affected?
- What about the train and the tracks affects the environment?
- What do people do to maintain train tracks?
- Does maintenance of the train tracks affect the environment?

HUMAN IMPACT ON THE ENVIRONMENT IN THE PAST
- How did the native Americans affect the environment?
- Do you think that there are some animals here or not here because of the Native Americans?

Table 4. An example of the questions developed by a quadrat team.

What is moss?
How does moss start?
Why do parents leave their eggs alone?
How do rays affect the environment?
What types of parental care are used in our quadrat?
What lives under the leaf litter?
What kind of eggs are these?
What species are in our quadrat?
Where do reptiles and amphibians live?
How do plants impact humans & other plants?
How far from the train tracks is the environment affected?
What animals are loners and what animals stay in packs?
Can animals see color at night?
Why do leaves turn color when they fall off?

Table 5. The initial questions the quadrat teams were to investigate.

The Atmosphere

- Structure
- Composition: Water, Oxygen, Hydrogen, Nitrogen, Carbon
- Atmospheric Change
  - Natural–Long Term/Short Term
  - Human Induced
  - Modeling & Predicting Climatic Change

Climate

- What is Climate? How does it differ from Weather?
- Seasons
- Biomes
  - Plant/Animal Associations
  - Evolution & Climate
  - Biodiversity
- Ocean Systems & Climate
- Paleoclimatology
- Predicting Regional Climate Change
- Societal Impact of Climate Change/Public Policy

The Changing Earth

- Plate Tectonics
  - Earthquakes & Volcanoes
  - Weathering & Erosion
  - Role of Life in Weathering
- Hydrothermal Vents
- Rocks & Minerals
- Ocean/Atmosphere
- Global/Regional Geology
- Fossils–Biodiversity & Extinction

Life on Earth

- Gaia Hypothesis
- Goldilocks—Venus, Earth, Mars
- Symbiosis
- Microcosmos
- Freshwater/Marine Ecosystems
  - Energy Transfer
  - Nutrient Cycles
  - Seasonal Change
  - Long & Short Term Change
    - Natural Change, Human Impact
  - Evolution / CoEvolution / Gaia
  - Paleoecology

Table 6. Suggested 9th Grade Science Content.

The Earth as an Integrated Global System - Physical and Life Science
  - The Components of Life, of the Atmosphere, of the Lithosphere
  - The Cycling of Elements
  - The Gaia Hypothesis

The Relationship Between the Earth and the Sun
  - Day/Night Cycles, Seasonal Cycles
  - Long-Term Influences

The Structure of the Atmosphere

Oxygen and the Ozone Layer
  - Origin of Oxygen
  - Oxygen Cycle
  - Ozone in the Atmosphere
    - Origin, Good/Bad
    - Destruction of Ozone Layer

Other Gases in the Atmosphere - Greenhouse Effect, Climate Change
  - Origin
  - Cycles

Acid Rain
  - Origin, Geochemical Cycles

Climate
  - What is climate and how does it differ from weather?

Oceans
  - Origin, Composition, Waves and Tides

Weathering and Erosion
  - Streams, Rivers, Lakes; Glaciers; Rocks

Volcanoes, Earthquakes, Plate Tectonics

Change over Time
  - Earth's History
  - Methods of Dating (Carbon Dating, Ice and Rock Cores)
  - Fossils, Extinctions

Human Interaction with the Earth

Table 7. Topical Presentations.

Library Research

- Books-Using Table of Contents & Index
- Popular Journals/Magazines
- On-line Library Searches
- Boolean Search

Information/Telecommunication Systems

- Internet
  - Resources / Search Engines
  - Joining a User Group
  - Downloading Data/Images
  - Connecting with International Researchers and Student Researchers
  - Creating a Home Page
- Project Work
  - Developing Partner Work Space
  - Portfolio Files & Analysis
  - GIS and Field / "Ground Truth" Data

AV/Media Systems

- Using Multi-Media Resources: CD-ROM, Laser Disc, Video

Scientific Methods

- Experimentation
  - Hypothesis Generation
  - Designing Experiments
- Field Observation
  - Keeping a Field Notebook
  - Ecological Methods
    - Collecting Representative Samples
    - Data Collection Methods
      - Quadrats and Linear Transects
    - Probability Theory and Statistics in Sampling
- Identifying Organisms - Five Kingdoms [Monera, Protoctists, Fungi, Animals, Plants]
- Focus Workshops: Microbes, Decomposers, Arthropods, Reptiles, Amphibians, Birds, Mammals

Reading & Writing Skills

- Note taking and Summarizing
- Metaphor & Interpretation
- Quantitative & Qualitative Discourse

Presentation Skills

- Oral, Written

Table 8. Skill Workshops.

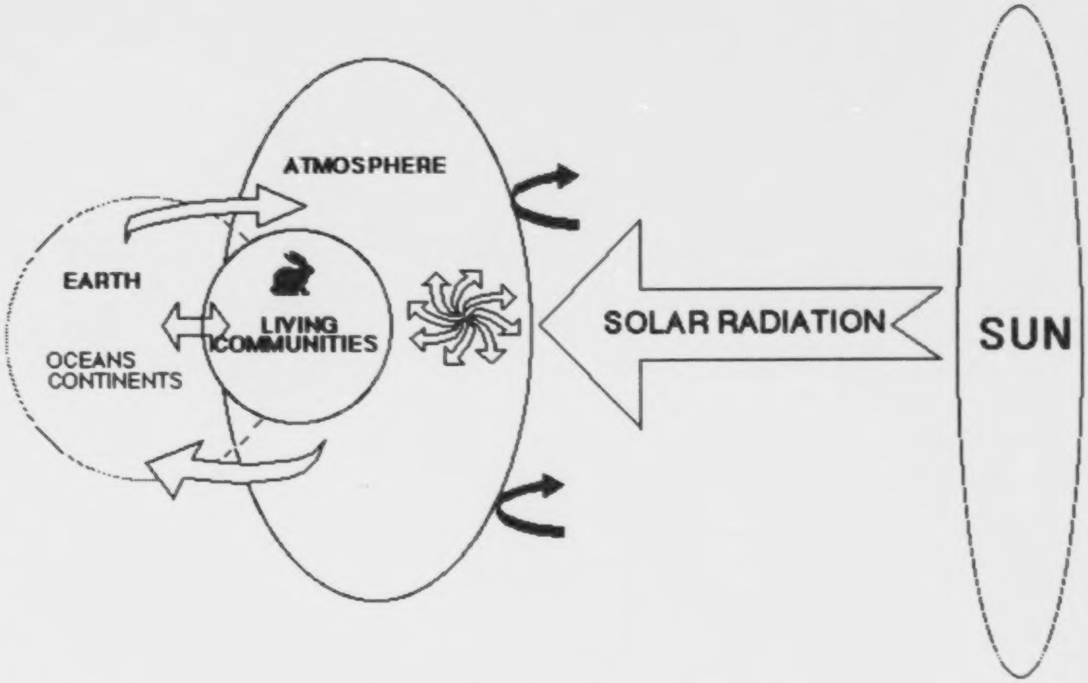
ATMOSPHERE
EARTH
OCEANS
CONTINENTS
LIVING
COMMUNITIES
SOLAR RADIATION
SUN

Figure 1. Conceptual Diagram of a Dynamic Living Earthth.

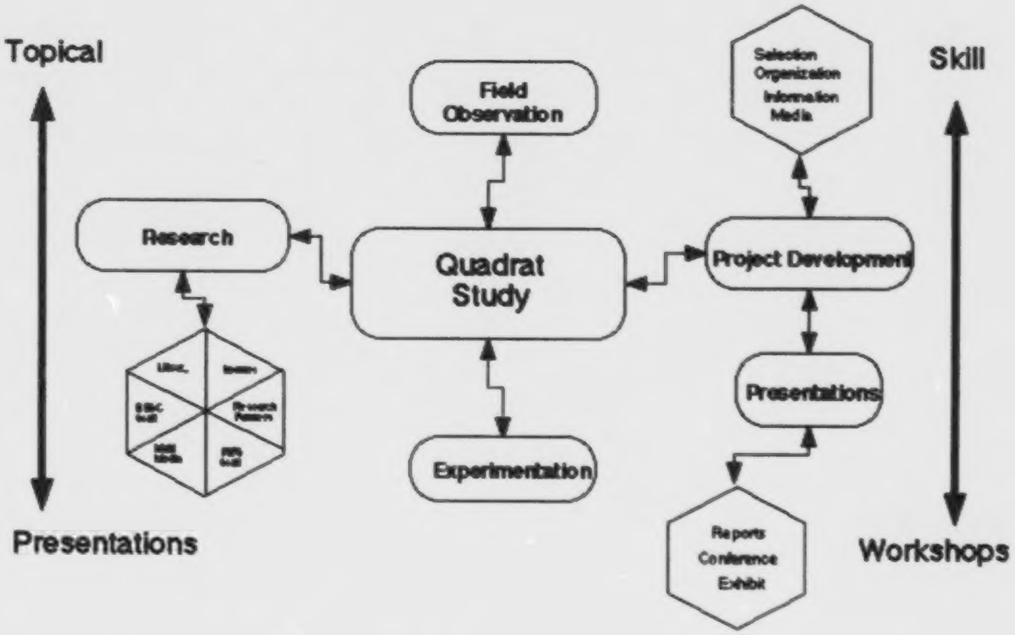
Topical
Presentations
Research
Libr.
Research Pattern
Field Observation
Quadrat Study
Experimentation
Selection
Organization
Information
Media
Project Development
Presentations
Reports
Conference
Exhibit
Skill
Workshops

Figure 2. Curriculum Structure.

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A Successful Environmental Enterprise: Curitiba - The Ecological Capital of Brazil

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Summary

Pioneer and innovative actions integrating government and private sector resulted in a successful enterprise, which transformed the city of Curitiba into the "Ecological Capital of Brazil". Some historical data will introduce Curitiba and briefly present the new project that will evaluate the air quality and simultaneously educate Monitoring the AIR Quality.

Looking for international bilateral cooperation and Environmental Education exchange programs, the aim of this presentation is to inform you about Curitiba—"The Ecological Capital of Brazil" —its evolution and its problems, which motivated the project "The Air Quality of Curitiba: Evaluate and Educate" for monitoring the level of ozone and particulates on the troposphere.

The successful environmental enterprises were advertised and the ecological capital, with the best living standard is rapidly being invaded by a horde of poor migrants. The statistics recently revealed that in five years Curitiba received 297,000 new inhabitants. Besides, its development brought new industries, new machines and new cars, which are contributing to rise the level of air pollution.

Introducing Curitiba

The 300 years old southern city is situated on a plateau about 905 meters above sea level, with a humid sub-tropical climate, surrounded by the Atlantic rain forest, in the south of Brazil. It is the capital of Paraná State.

Population is 1.4 million now. Its growth was relatively slow until 1870, then it increased significantly due to colonization by European immigrants—the majority were German, Polish, Italian, British, Swiss, French, and later Arab and Japanese.

In the 1960's some urban and social problems were detected, like housing, sanitation, transportation and environment. In 1970 consistent planning with integrated programs and innovative urban solutions were implemented, and they gradually succeeded in transforming Curitiba's living standards into the best in Brazil.

Integrated Environmental Programs

a. **Street network planning** - the main urban plan guideline established a linear pattern for the city's physical growth along structural corridors.

b. **Integrated transportation network** - consolidating the entire bus system, it allows passengers to transfer to different bus routes by paying only a single fare., including the "Ligeirinho" (Quickie)—biarticulated buses with a capacity of 270 passengers, boarded in tube-shaped stations made of laminated glass, with platforms on the same level as the bus floor. It saves boarding time and the trips are 50% faster.

c. Water supply and sewage - Curitiba supplies treated (potable) water to more than 95% and sewers to 85% of its inhabitants, as a result of the Environmental Cleanup program.

d. Green areas - To harmonize urban spaces with environmental preservation Curitiba boasts of 21 large parks and natural woodlands, which are accessible to visitors by the Tourist line or "Pro-Park" bus line, and nearly 100 kilometers of bicycle paths. In the 1970's Curitiba had only half a square meter of green area per inhabitant, while today it has more than 50 square meters per inhabitant

e. Industrial district - It is called "Industrial city", but it is only a district devoted to 360 enterprises—factories/firms that employ more than 50,000 workers (and use indirect labor of 150,000). Out of the district's 44 million square meters, 27 million square meters are green areas.

f. Waste - A selective waste-removal program entitled "garbage that is not garbage" is being successfully developed by the municipality, using trucks to collect the selected waste, providing bus or food vouchers in exchange. The students can exchange it for books and classroom material.

g. Environmental Education - Formal and informal teaching strategies have been developed since the 1970's along the environmental projects, with the purpose of creating environmentally correct awareness and attitude. Innovative and pioneer actions were conceived and implemented, and among the most significant are

1. the creation of the Open University for the Environment, in 1991, offering a wide range of courses designed for the general public, opinion makers, teachers and professionals working in this field, and
2. the implementation of the Doctoral Program for Environmental Studies/Research and Development, by the Interdisciplinary Nucleus of Environment and Development—(NIMAD) of the Federal University of Paraná in 1993.

h. Monitoring the Air Quality - a new project in full development by the Federal University of Paraná and Environmental Institute of Paraná State, which will measure/evaluate and educate the members of the internal and external communities, where students and teachers of the university are interacting with the community in order to collect data and disseminate knowledge about cleaning the air, in its initial phase. It is evaluating the level of ozone and particulates . In the next phase it will include students and teachers of 50 primary schools. The project is being coordinated by Prof. Dr. Zióle Zanotto Malhadas and Prof. Ines Moresco Danni-Oliveira.

(PS. We are looking for inexpensive/alternative methodology to collect and evaluate the particulates, as well as the rain water. Suggestions are welcome. Please get in touch if you can help us. Fax 55 (041) 366-2723.)

Appendix 1 - ENVIRONMENTAL RESEARCH AND EDUCATION PROJECT "THE AIR QUALITY OF CURITIBA: EVALUATE & EDUCATE"

Monitoring the Level of Ozone and Particulates on the Troposphere

Promotion: Universidade Federal do Paraná - NIMAD
Nucleo Interdisciplinar do Meio Ambiente e Desenvolvimento
Departamento de Geografia
Instituto Ambiental do Paraná

Coordinators: Prof. Dr. Ziόle Zanotto Malhadas
Prof. Ines Moresco Danni-Oliveira

Presentation: The objective of this interdisciplinary and interinstitutional project is to promote environmental awareness of the importance of AIR quality through an integrated process of measurement/evaluation and education, involving students and teachers of the Federal University of Paraná, as well as members of the community in participative activities of research, environmental studies and awareness. Continued actions are planned to disseminate the results and to foster new attitudes towards the cleaning of the AIR and health preservation.

Method: Two main surveys are planned—one in the winter and another in summer. The ozone level will be evaluated through the use of a small monitor—the ECO-Badge (Vistanomics'). The particulates level will be evaluated through an alternative methodology, making use of small paper filters (drying/weighing). Data will be collected in 50 places evenly distributed all over the city, for 30 days. Dynamic systems of climate control will also be registered during the research period.

TARGET: Environmental Education through research, instruction and awareness is the aim to be achieved. Therefore, didactic material will be elaborated. Textbook and video-course will be produced and edited in order to disseminate the new knowledge and the results of the research project.

Threatened and Endangered Animals: The Extended Case Study as a Method of Environmental Instruction

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Threatened and Endangered Animals (Hagengruber & Hungerford 1993) is the latest of three extended case studies (ECS) which include *A Science-Technology-Society Case Study: Municipal Solid Waste* (Ramsey, Hungerford, & Volk 1989) and *Wetlands: A Major North American Issue* (Culen 1992). These case studies are recommended for learners from sixth grade to adult. They are an outgrowth of *Investigating and Evaluating Environmental Issues and Actions: Skill Development Modules* (IEEIA) developed by Hungerford, Litherland, Peyton, Ramsey, and Volk (1988).

This paper will present an overview of the *Threatened and Endangered Animals* extended case study (ECS). A presentation of research conducted on the extended case study format will follow the overview. This paper will conclude with a discussion of the use of the ECS format in environmental education.

The Extended Case Study: An Overview

The five chapters which compose *Threatened and Endangered Animals* were constructed around and correlated with the goals for curriculum development in environmental education proposed by Hungerford, Peyton, & Wilke (1980).

Chapter One: An Introduction

Chapter One focuses on providing the learner with an ecological knowledge base concerning threatened and endangered animals. This knowledge base is necessary so that the learner might make ecologically sound decisions concerning issues dealing with threatened and endangered animal issues.

Learners begin by making a distinction between the terms threatened, endangered and extinct. Learners then study the history of extinction and compare it to the history of human population growth. Next, students learn about conditions which may lead to the inclusion of a plant or animal species on the threatened, endangered, or extinct species list. Learners are also introduced to reasons why plant and animal species should be preserved.

Chapter Two: More About the Animals

This chapter provides the learner with the opportunity to dig deeper into the threatened and endangered issue. Data are provided which identify US species that have been listed as endangered, as well as the number of endangered species per state. This data is used to help students develop the idea that endangered animals are not isolated phenomena, rather, they are quite common. The Endangered Species Act (ESA) set into place in the United States in 1973 is explained and discussed. The presentation of the ESA provides learners with the legal base often used in the defense of wildlife and wild places.

This chapter concludes with the presentation of animals which are endangered and their plights. A variety of animals are included, helping to reinforce the idea that endangered animals are not just concentrated in one area. These examples also provide the learner and the instructor with fuel for discussions concerning problems which lead to the threatening, endangerment, and extinction of species.

Chapter Three: Issue Awareness

The development of skills associated with issue analysis are the emphasis of this chapter. Learners begin by distinguishing between a problem and an issue. Once these skills are firmly established, the learner begins to analyze environmental issues. Players, their beliefs, and the values associated with these beliefs are identified.

The skills associated with issue analysis help provide the learner with a depth of understanding on the issue. It is at this point that learners may be able to understand what players are thinking, saying, or doing concerning selected environmental issues. Learners also begin to critically analyze their own feelings concerning the issue. Environmental issues, with players representing multiple sides, are provided for the purpose of analysis.

Chapter Four: Issue Investigation

At this stage of the case study learners begin to develop the skills necessary for their investigation into threatened and endangered animals. Students learn about and practice the skills necessary to develop surveys, questionnaires, and opinionnaires. The learners write research questions from which they generate instrument questions or questions to be used to gather data concerning an issue. Sampling techniques are also discussed.

Once the data collecting instruments are ready, learners use them to collect data from a sample of the appropriate population. These data are then analyzed, allowing the learner to develop or practice their math and graphing skills. Once the data are analyzed, the learners interpret the data by drawing conclusions and inferences, and making recommendations. Examples of data gathering instruments are provided as well as rules for writing research questions.

Chapter Five: Citizen Action

The case study concludes with an introduction to citizen action taking. Four categories of responsible citizen action are identified and explained. A vital component of this chapter occurs when students are asked to make action recommendations concerning the issue they investigated. While the authors feel that learners should not be required to carry out their recommended actions to completion (it would then become the instructor's action) they feel that learners should be required to carry out the actions as far as possible. For example: if the learner recommended that they write an article to the local paper, they should physically write the article and the cover letter which might accompany it. Learners would not be required to send the article and cover letter to the paper, that is their decision. The culminating activity is a presentation of the investigation to the class, and depending of the age of the learner, a culminating paper.

Research On The Extended Case Study

All of the case studies discussed in this section were developed utilizing the goals for curriculum development in environmental education (Hungerford, et al. 1980). Due to space limitations the writer will address the research in very broad terms.

Deforestation

Withrow (1988) conducted a study which utilized a deforestation case study, developed by Withrow, as the treatment. Withrow's control group received science instruction utilizing a well-known sixth grade science textbook. Both groups (control and experimental) consisted of combined fifth and sixth grade classes. Both groups received instruction for ten weeks. Data were collected utilizing a posttest only format.

Withrow's findings indicated that the experimental group exhibited significant gains at the .05 level in knowledge of deforestation, knowledge of environmental action strategies, self-reported overt environmental behavior, perceived knowledge of environmental action skills, and perceived skill in the use of environmental actions. No significant differences were found between groups in the categories of individual locus of control and group locus of control.

Canada Goose Management

Simpson (1989) studied the effects of a case study which focused on the management of the Canada Goose. Simpson utilized a pretest on overt citizenship behavior (the criterion variable) to equate the groups; no significant differences were found between groups. Simpson then conducted a posttest on both experimental and control groups after the extended case study treatment was administered.

Simpson's experimental group received instruction using the case study approach. The experimental group consisted of nine classes; seven fifth grade and two sixth grade classes. The control group consisted of six classes; four fifth grade classes and two sixth grade classes. Students in the control groups received traditional textbook driven science instruction.

Simpson's results indicate significant gains were made by the experimental group at the .05 level on the variables of overt citizenship behavior, knowledge of citizenship action, and perceived skill in the use of citizenship action strategies. No significant differences between groups were found on the variables individual locus of control and group locus of control.

Wetlands

Culen (1994) conducted research on the effects of an ECS which was developed around the topic of wetlands. Culen conducted a pretest to test for group differences; none were found. Culen then posttested both experimental and control groups after the extended case study treatment was administered.

Culen's experimental group consisted of four seventh and two eight grade classes, the control group consisted of two seventh and three eight grade classes. The experimental group received instruction in the wetlands ECS which lasted between ten and fourteen weeks. The control group received traditional science instruction lasting twelve weeks.

Culen's results indicated that significant gains at the .05 level were made by the experimental group on the variables knowledge of ecological foundations, overt environmental behavior, individual locus of control, knowledge of citizenship action skills, and perceived skill in the use of citizenship action skills. No significant differences between the groups on the variable group locus of control.

Concluding Discussion

Research on extended case studies which were developed utilizing the goals for curriculum development by Hungerford et al. (1980) indicate that students, who encounter these ECSs, can make significant progress in the development of some variables associated with environmentally responsible behavior (Hines, Hungerford, & Tomera 1986/87; Sia, Hungerford, & Tomera 1985/86). Another advantage of the ECS is the instructional flexibility and its multi-disciplinary nature. According to Hungerford and Volk (1990) the instructional time necessary for completion of an ECS is much less than the full issue investigation model. This decreased instructional time requirement makes the ECS a viable option for inclusion in most disciplines. The time requirement when coupled with the multi-disciplinary nature of the curriculum makes ECS ideal for use in middle schools, where learning themes are a part of the curricula, or where "environmentalization" is the goal of an institution (Simmons 1989).

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Integrating Children's Literature With Hands-On Science To Teach About The Environment

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Introduction

The purpose of this project was to (1) demonstrate an alternative approach to the teaching of environmental education (EE) in light of more contemporary definitions of both reading and science and (2) to provide a safe environment for teachers to practice their newly acquired skills. The program targeted teachers of traditionally underserved groups, including handicapped, ethnic minorities, individuals with limited-English proficiency and individuals residing in rural areas.

Reading and Science

Both the "whole language" approach and the scientific method require students to build generalizations, question, carry out formal experiments, and draw conclusions. Strategies in "learning to read" and "learning science" are similar, e.g., observing, comparing, measuring, using time/space relationships, interpreting, communicating, predicting outcomes, making judgments, and evaluation. Children's literature is a major strength and interest of elementary teachers. Selecting a fiction book with a scientific theme, allows a teacher to develop a science lesson that provides both scientific information and reinforcement. Well-chosen, literature reinforces the idea that science is part of daily life. The science concepts come from a story about characters and places, enabling students to understand and remember them more easily than from a textbook. Science and literature are integrated using hands-on activities or field investigations to reinforce ecological concepts and principles found in the book.

Ada County Greenbelt and Environmental Facilities

A wooded greenbelt extends 20 miles along the Boise River and accentuates an urban river that still attracts fly fisherman angling for trout, whitefish, and bass. Nest boxes help attract native bird species to the area. The river is a winter migration route for the Bald Eagle and eagles perch and fly throughout the Boise area. The wooded corridor connects six major urban parks, the Kathryn Albertson Urban Wildlife Sanctuary, MK Nature Center, Great Basin Native Plant Garden, Boise Zoo, and Idaho Botanical Gardens. Each facility can be used to help increase the public's understanding of ecological concepts, unique facets of Idaho's natural environment, and aspects of local Idaho history.

Methods

Workshop Design

The elementary curriculum depends largely on the interests of the teachers, only a quarter of whom feel "well qualified" to teach science. Many elementary teachers feel science and reading are important, but only the teaching of reading in the elementary school is of prime importance. A reason elementary teachers emphasize reading and de-emphasize science is they do not feel confident teaching science the way they were taught. Our project included a workshop which: introduced teachers to science activities that could be used when visiting Ada County's EE facilities; involved teachers in investigations and hands-on activities demonstrating how the greenbelt could be used to teach science; and demonstrated how activities and investigations could be integrated with reading and writing sessions.

Lesson and Activity Design

Recommendations from current research in brain-based learning and the whole science approach were used when designing our materials. The Interpretation of Data Process and a questioning strategy developed at the Northwest Regional Educational Laboratory were also used in our lessons. The materials incorporate cooperative learning techniques; emphasize concepts of plant and animal ecology, wildlife management and ideals of resource stewardship.

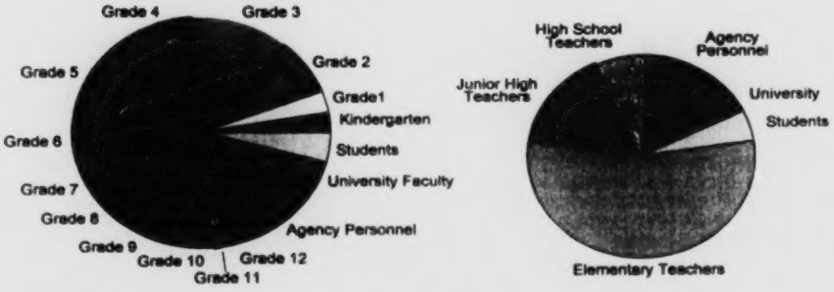
Results

Forty hands-on/minds-on EE lessons that could be used by teachers, parents, and volunteers visiting Ada County's EE facilities were developed. Twenty pre- and post-field trip lessons were generated to introduce students to ecological concepts prior to participating in trips to the EE facilities and to review those concepts upon returning to the classroom. Thirty-six lessons combining hands-on science and emphasizing Native American stories were also developed for the project.

Lessons were pre-tested by 45 teachers, curriculum specialists, and natural resource agency personnel at a half-day session held at the Alpine EE Conference at Alpine, Wyoming, in June 1994. A weekend workshop was advertised for July and filled within 24 hours. The 27 participants represented 12 school districts, including Nampa, Caldwell, and Payette, which have some of the highest minority student enrollments in our state. Four of the 27 teachers (14.8%) belonged to a minority class. The lessons were revised and further tested by 28 participants at a half-day session held at the Heartland Peaks EE Workshop in McCall, Idaho.

The lessons were field tested by a total of 100 K-12 educators and natural resource agency personnel from 10 states during the summer workshops. Educators testing the lessons elementary (56 %), junior high (16%) and senior high (7%) teachers. Of the 100 individuals involved in the field testing 11% were natural resource agency personnel, 5% university faculty, and 5% students (Fig. 1). Twenty-five more educators and agency personnel reviewed the materials at the 1995 Alpine Conference and Heartland Peaks Workshop.

GROUPS FIELD TESTING LESSONS



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Discussion

Changing Demographics

A concerted effort was made to involve members of Idaho's largest minority populations, Native American and Hispanic, and teachers working with minority students. The Nampa, Caldwell, Wilder and Vallivue School districts, four districts in a county with Idaho's highest concentration of Hispanic students and Pocatello with a large Native American population, financially supported teachers attendance at workshops where our materials were tested. Boise and Meridian, two of Idaho's largest school districts, report almost 20% of their students, double the percentage reported five years ago, describe themselves as Asian, Black, Hispanic or American Indian. There are seven and one-half times the number of American Indians, three times the number of Blacks and Hispanics, and one and one-half times the number of Asians in the sixth grade as compared to the ninth. These two school districts financially supported teachers attending the workshops. An EPA grant provided stipends to teachers who were not supported financially by their districts.

Why Environmental Science and Children's Literature?

Teachers at all levels want to learn science. Much science teaching, however, inhibits learning. What must be overcome is the belief that science equates to the mere memorization of facts discovered by others. We believe integrating environmental science with literature addresses this concern. We demonstrate science can be taught in an interesting, logical and fun manner and students can have experiences which contribute to the acquisition of understandings, attitudes, and abilities in science. The teaching of science does not require a de-emphasis in reading. Science can be conveyed through lessons involving reading, writing, and language arts. We were supported in this belief by a participant who wrote "Sometimes it is difficult to set aside time for science, but this approach shows how all curriculum areas fit together and the children benefit."

Teaching science to young children requires the presentation of sophisticated ideas in ways that allow them to gradually build scientific understandings that reflect the current state of knowledge (NCSESA 1993). Children must experience learning and be allowed to build meanings and relationships for themselves. The reading of fictional material followed by experiments to test hypotheses derived from these readings allows children to do science as it is performed by the scientist. They do not simply follow directions presented by the teacher. The strategies and process skills needed to understand and interpret the scientific world are more significant than specific facts (Blosser 1986).

A *Need for Writing*

Just as children are encouraged to begin reading on their own, so too should they be encouraged to begin writing. Our workshops emphasize the keeping of journals of experiences related to the environment. Participants separate feelings about a habitat from specific observations and keep personal dictionaries of new words.

Mentors

The use of mentors is not a working concept in today's schools. There are few documented examples of young teachers' benefiting from the knowledge and experience of master teachers. We consider interactions with experienced faculty an important part of the induction process. We believe a hierarchy of acceptance of new materials, demonstrations, and ideas exists within the teaching community. Teachers must be guided through and work with peers to learn science activities. Teachers, however, are not convinced an activity will work until he/she tries it. In our workshops, the teacher is asked to practice his/her newly developed skills under the guidance of a mentor or master teacher. Practice convinces participants they can make the activities work and can successfully facilitate post-activity discussions. When asked what was the most worthwhile aspect of the workshop, a participant wrote "Hands-on demonstrations and role modeling by instructors" and " actually doing the activities...."

We believe learners should be guided to an understanding of science and provided with high levels of information, experiences and ideas. Hands-on, real-world experiences should take precedence over the textbook examples. The speed at which our workshops filled reinforced our belief there is a great need for EE at the local level and our premise that if you offer science in an activity-based format teachers from all grade levels will attend. Participants commented the workshop was one of the most beneficial they had taken. The teachers' feelings about the workshop were succinctly stated by one evaluator who wrote "Do it again so my co-workers can attend. This is a valuable experience which relates directly to the classroom."

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Lessons Learned about Professional Development for EE Teacher Educators

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Introduction

The National Consortium for Environmental Education and Training, led by the University of Michigan's School of Natural Resources and Environment, was funded by the U.S. Environmental Protection Agency's Office of Environmental Education from 1992-1995. One major effort of the project was the production and evaluation of resources for teacher educators in the EE field—the EE Toolbox. The Toolbox includes a workshop resource manual, slide kit, and other materials that help teacher educators introduce models and ideas to teachers that enabling them to address environmental issues in the classroom. The Toolbox addresses areas such as designing workshops, integrating EE content into the curriculum, teaching issues, evaluating materials, and using computers in EE.

In the current climate to reform education and "professionalize" teaching (Goodlad 1990, Griffin 1990, Herbst 1989, Swart 1990), the Toolbox provides professional development and a model of adult education to teacher educators in the EE community. To support the Toolbox, NCEET offered customized workshops to help a variety of teacher educators (professional educators, environmentalists, and environmental managers) begin or improve their teacher education programs.

To evaluate the effectiveness of the Toolbox we analyzed three sources of data:

1 & 2) We surveyed 236 Toolbox Workshop participants twice, before and after workshops (conducted between June 1994 and January 1995). 161 returned needs assessments (68%); 104 returned usable follow-up surveys in April 1995 (44%), and

3) We surveyed 116 individuals purchasing the Toolbox between June and December 1994. Sixty-nine (69) were returned (59%).

In addition, facilitators' records and notes and participants' workshop evaluations are used to help explain and understand the data.

This report will describe the sample of teacher educators surveyed and consider how their responses address the following questions:

- What skills are perceived as needs in professional development?
- Are training workshops essential to the effective use of materials?
- How flexible are the Toolbox materials?

Description of Teacher Educators Surveyed

Workshop participants have served in a variety of positions over the course of their employment, with many individuals working in both the education and environmental fields (see Table 1). Nearly half of those with Natural Resources/Environmental positions, for example, report at least one job in formal or nonformal education. Those respondents purchasing the EE Toolbox without taking a workshop have a similar work history, but a larger percentage have worked in formal and nonformal education.

Table 1: Percentage of respondents who have held these positions

	A*	B**
Classroom teacher	40	50
Program coordinator	39	65
Nonformal educator	35	45
Natural Resources specialist	27	31
University faculty	19	33
Business or industry	19	10

* Respondents attended Toolbox workshop (n=161)
** Respondents only purchased Toolbox materials (n=69)

Toolbox workshop participants, as a whole, were not experienced at providing workshops for teachers. Only half of the workshop participants currently provide teacher workshops; of these, only a third have more than five years of experience (see Table 2). Respondents who purchased Toolbox materials, as one might expect, have significantly more experience in providing workshops ($p < .005$).

Table 2: Percentage of respondents with experience facilitating teacher workshops

	A*	B**
None	50	9
Less than 1 year experience	8	13
1-5 years experience	25	23
More than 5 years experience	17	55

* Respondents attended Toolbox workshop (n=161)
** Respondents only purchased Toolbox materials (n=69)

For individuals in both groups, their teacher workshops tend to feature existing curriculum and nature/science topics (river ecology, earth science), not issues (solid waste, biodiversity). The teachers attending these workshops tend to be teaching grades 4-6 and are either with self-contained elementary classrooms or science classes. This profile of EE inservice providers conforms to that described in the National Survey of EE Teacher Inservice Education (NCEET 1994), which found that the predominant model for EE teacher workshops is that of Project WILD and Project Learning Tree, which emphasize activities focused on ecology and nature.

What skills are perceived as needs in professional development?

The needs assessments sent to those registered for the Toolbox workshops listed 24 skills that workshop facilitators might use. Respondents indicated which they were interested in learning more about. The five skills that participants were most interested in exploring were:

- Surveying the needs of participants

- Helping teachers adapt activities for their classroom
- Helping teachers engage students in valuing activities
- Including activities to build problem solving skills
- Evaluating workshops

Neither the skills that connote "workshop basics" such as using small groups and demonstrating activities nor the "advanced" skills such as providing follow-up support and helping teachers design their own units and lessons are of greatest interest to these facilitators. Nevertheless, they are hoping to increase their profession skills in ways that will move their workshops, the curriculum resources, and EE forward (NCEET 1994).

Are training workshops essential to the effective use of materials?

Users of the materials who did not attend a workshop have considerably more experience conducting workshops than those who attended Toolbox training sessions, so a comparison of their efforts is not equivalent. Nevertheless, as many as 48% of the non-workshop respondents report they have already used one or more of the eight units. This is an impressive figure, considering respondents only had several months during the school year to review the materials. An additional 41 - 56% of the respondents reported that they have leafed through the material and thought about how to use it or know who might need it.

Thirty-three percent of the workshop participants report having already conducted a teacher workshop using the Toolbox materials, and an additional 10% have planned their workshop. The reasons most often cited by those who have not yet conducted a workshop are lack of time and not a job priority.

Unlike many curriculum materials, the Toolbox was not intended to be a recipe for success. Rather, the text encourages workshop facilitators to adapt and modify activities to meet local needs, using the materials as a springboard rather than a master plan. Twenty-five percent of non-workshop respondents report ways they have modified the materials to meet their needs; 23% of the workshop participants who have conducted their own teacher workshop report modifying activities. Thus it appears that at least for this use of the Toolbox, a workshop is not necessary for experienced individuals to use the materials as they were intended.

How flexible are the materials?

The materials in the EE Toolbox were designed to meet the diverse needs of teacher educators with different levels of experience in teaching and planning. It is refreshing to note that among those respondents using the materials who have not been to a workshop, the different needs and uses are apparent. Similar questions were not asked of workshop participants, as their workshop tended to focus on only a few units and their perspective of usefulness would be strongly affected by the workshop facilitator.

Respondents were asked to rate the usefulness of each unit on several possible purposes. Table 3 identifies the scores greater than 3.0 (on a 1-4 point scale) for each purpose and each unit. The highest scoring purpose for that unit is indicated with an exclamation point. This indicates that the units are not equal. Just as a hammer has some ideal purposes and a wrench others, certain units in the Toolbox have slight advantages over others.

Table 3: Non-workshop respondents who have used and plan to use materials report distinctly different uses of the Toolbox units (n=35)

	Purposes*			
Unit Names	A	B	C	D
Defining EE	3.3!		3.1	3.1
Approaching Issues	3.4!	3.1	3.1	3.1
Designing Workshops	3.3!	3.0	3.3!	
Integrating EE	3.2	3.2	3.2	3.2
Using Computers	3.0	3.5!	3.3	3.4
Evaluating Resources		3.4!	3.1	3.0
Urban EE		3.0	3.2!	3.2!
Community Resources	3.2	3.2	3.2	3.3!

* Purposes of individual units in the EE Toolbox
A = Most useful for helping me teach other workshop facilitators
B = Most useful for increasing my own knowledge
C = Most useful for helping me add new components to a program
D = Most useful for providing new activity ideas
! = The highest scoring purpose for that unit.

In Summary

The naturalists, teachers, university faculty, extension agents, camp directors, and resource managers across the United States who conduct teacher workshops in environmental education may appear to be a diverse group, lacking in any common denominators. This study indicates that their diversity as a group is also an individual trait: they tend to have several types of jobs, and those in environmental fields have often had jobs in education.

On the other hand, the diverse group of teacher educators in our study tend to reach the same type of teacher with similar workshops: upper elementary in self-contained or science classrooms with nature and science related curriculum materials. In terms of professional development in teacher education, they seek the types of skills that will help individualize their workshops to meet local needs, help teachers individualize curriculum to meet students' needs, and engage teachers in more valuing and problem solving activities.

In our sample, experienced teacher educators who purchased the Toolbox materials have been able to use them and to modify the suggested activities without a workshop. Clearly, for them, a workshop is not necessary to be able to use these materials. This is not to say that experienced educators do not benefit from workshops, however. Of the participants in the Toolbox workshops, a sizable minority were experienced workshop providers. They report the same types of workshop goals and benefits as did their less experienced counterparts. Most of the workshops attended by practicing teacher educators included an opportunity to engage participants in testing, exploring, discussing, improving, and critiquing the materials. No doubt these opportunities are important for any professional.

The workshops NCEET offered to those new to the business of teacher education included an opportunity to practice the skills being taught, i.e., participants led a teacher inservice workshop. Follow-up mentoring seems to be important in helping these new teacher educators organize their own workshop. These skills are not quickly gained, however. We realize they are developed over time, with the support of colleagues and supervisors, and when individuals are willing to try new ideas, evaluate and reflect on the experience, and try again.

These data show that the Toolbox materials as a whole have a variety of uses and are written in such a way that users are encouraged to adapt the suggested activities and ideas to their own situations.

From our experience as workshop facilitators, states and organizations have a variety of norms around professionalism and staff development. For some, the EE Toolbox materials will serve a great and unique need in the environmental education field in the "professionalization" of teacher educators.

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The Use of Remote Sensing and Geographic Information System Technologies in an EE Curriculum

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Introduction

During the past four school years, teacher development workshops were conducted by University of New Hampshire (UNH) scientists in close collaboration with University teacher educators. These hands-on workshops helped teachers introduce their students to selected theories and techniques characterizing state-of-the-art environmental monitoring. The focus of the inquiry-oriented scientific research program is one in which New Hampshire high school teachers and their students collaborate with UNH scientists to monitor forest ecosystems local to their schools (Kull and Moss, 1995). Data acquired through this statewide program make a valuable contribution to ongoing research activities currently being conducted at the Institute for the Study of Earth, Oceans, and Space, located at UNH. The over 75 teachers and 2,000 student participants from over 50 schools throughout the state have formed an environmental monitoring network that has been acquiring data from New Hampshire forests for over four years, and the program continues to expand. The program incorporates traditional biologic preparation of plant material for examination under the light microscope as well as the state-of-the-art interpretation of full-color satellite images acquired from approximately five hundred miles in orbit. The satellite images provide a unique perspective from which students and teachers can begin to explore, map, and monitor local areas of interest, and simultaneously examine their study area within a larger, regional perspective. The satellite data may also serve as an excellent data layer in a student generated geographic information system (GIS).

Environmental Education

From deforestation to the destruction of the ozone layer, problems with our environment are frequently highlighted by the mass media. However, few students in the US have the opportunity to formally study environmental science in secondary school (Disinger and Floyd, 1990). Disinger and Floyd report several states have mandated environmental education in schools and/or teacher education in that field, but most have no established curriculum. However, they also state that a great deal of informal study in the area of environmental education occurs throughout many schools in the US.

Disinger and Floyd (1990) argue that most of the support for environmental education, if any, occurs at the state or local level. They state that support for environmental education in the US has been on a roller coaster since the late 1970's, and that support is often short-lived and directly tied to newsworthy topics such as the Exxon Valdez disaster. However, they describe several long term, successful environmental education programs including Project Learning Tree, Project WILD, The CLASS Project, and NatureScope. Many of the lessons within these programs, like the UNH model, are designed to be hands-on and interdisciplinary in nature, incorporating topics from the sciences as well as from the arts and humanities.

The UNH model, entitled Earth Day: Forest Watch, focuses on the assessment of white pine (*Pinus strobus*), a natural bio-indicator of certain types of air pollution, especially tropospheric ozone. However, the model can also be thought of in more general terms: *students and teachers as scientists*. This model offers classes the opportunity to make real scientific measurements, analyze data, and share results which support an important, relevant ongoing research effort in New Hampshire. The curriculum generated to support these scientific activities and data collection protocols is constantly under revision with input from teachers and students who participate in the program. That is, students and teachers as research partners have helped focus and re-shape (1) the original scientific question, and (2) the data collection methods and protocols. Although the Forest Watch program may be best suited for inclusion within an EE class, many activities have been successfully used within various science and humanities classes.

Technology

Technology in the 1990's includes interactive videodiscs, computers, satellite technology for environmental assessment, GIS, and international computer networks. Technologies like these, wrote Yager and Blosser (1991), may contribute to meeting current national science reform goals. Karwin (1992) stated that university-school partnerships have often helped schools meet the demands of current reform efforts. He also wrote that schools may specifically benefit through on-site teacher training activities. Dickinson (1992) explained that there is a need for a broad cooperative effort directed toward the enhancement of science education, including environmental science education that incorporates technology. The UNH model involves both university-school partnerships and the use of technology to collect and analyze data.

In order for the Earth Day: Forest Watch program to be successful, basic concepts in environmental assessment, computers, GIS, and satellite based remote sensing technology must be effectively conveyed to program participants. Firstly, computers are often used throughout the entire Forest watch program. They may be used for word processing, databases and spreadsheets, graphing, and multimedia authoring. Perhaps the most innovative and exciting use of computers for this program may be in the use of remote sensing and GIS applications.

The use of Landsat Thematic Mapper (TM) remote sensing data within the Earth Day: Forest Watch program allows students to visualize their local research sites within the larger context of the New England region. Also, these digital satellite images can be easily manipulated with image processing software for the Macintosh platform, allowing students and teachers to begin to analyze data. Land use/land cover analyses are routinely completed utilizing Landsat TM data.

Geographic information systems provide a means to integrate all forms of spatial data (Fitzpatrick, 1993). A specific example of how schools are re-shaping and improving the capabilities of the Forest Watch program is through the investigation of ways in which remote sensing data layers may be incorporated into a GIS. There could be many benefits of incorporating a computer-based mapping component to the program, including allowing students and scientists to visualize patterns in the data that may not be detectable with any other method of data processing or presentation.

Summary and Implications

As described in Kull and Moss, 1995, the teachers found it very valuable to participate in a cooperative program with university scientists. They thrived on the cooperative activities in many forms, with university personnel, with their students, and with their fellow teachers. They generally believed making environmental measurements was important. Teachers were also interested in learning much more about remote sensing and image processing activities. As expected, teachers had excellent suggestions with regard to the expansion of the program, including involving their local communities, bringing schools on-line via a computer network to share data and lessons learned, and working cooperatively with teachers in other disciplines. Generally, scientists provided the technical expertise for the program. Teachers and teacher educators provided the pedagogical expertise along with a "school laboratory" setting in which to test the methods devised by the scientists.

When incorporating technology in an EE curriculum, especially technology which supports remote sensing and GIS applications, careful consideration must be given to balancing the time dedicated to both the process of learning technology and other skills versus the product that is generated as the result of working with the technology. Process skills may be best emphasized early on in the EE curriculum, however students seem initially interested in producing the best product possible, with little regard for the process. Process skills should include problem solving, group skills, and critical thinking skills as well as skills that will allow them to best utilize the technology. Products may take on many forms as well, including maps and reports. Careful attention should also be given to how students will be assessed on their progress throughout the semester. Traditional methods of testing may not be adequate for many EE curricula.

Finally, when considering the use of technology in an EE curriculum one must consider its overall effectiveness with regard to student learning. Much research needs to be completed with regard to the effectiveness of using remote sensing and GIS technologies within these types of classes. The assumption is made that the use of these technologies will somehow improve learning, and this may certainly be true. If the use of these technologies is indeed greatly improving learning for the students, perhaps their use should be expanded. If their use somehow effects students in a negative manner, their use should be curtailed until reasons are better understood, and may be corrected. Research such as this is currently being initiated at UNH.

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Using the Investigating and Evaluating Environmental Issues and Action Curriculum in a Preservice Teacher Education Program

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Due to the pressures that the world's 5.5 billion people are putting on the environment, it is degrading at an alarming rate. The oceans are overfished and polluted, the air is polluted with excess greenhouse gases, the rain forests are being clearcut, landfills are overflowing, the soils are full of toxic agro-chemicals, to list just a few of the environmental problems that the world faces. Living in an environmentally degraded and technologically driven world today, young learners must cope with these situations on a day to day basis at home and at school. The National Science Teachers' Association in one of its Project Synthesis goals for scientific literacy rightfully indicates that learners should become skilled on how to deal with science-technological-societal (STS) issues. Most environmental issues are STS related. How can this goal be achieved?

There must be many different suggestions from different sections of the human society on how environmental and STS related problems and issues can be solved. The school is however one of the sure places in which skills to solve these problems can be acquired. The school curriculum therefore should have an allocation for the learners to be exposed to such skills. For a start, those who are responsible for helping students acquire the skills (teachers) must learn these skills. This is the rationale behind the Investigating and Evaluating of Environmental Issues and Actions (IEEIA) curriculum which is being taught to elementary science majors at Southern Illinois University at Carbondale.

The Investigating and Evaluating of Environmental Issues and Actions curriculum was originally developed by Dr. Harold Hungerford and Mr. Ralph Litherland about some twenty years ago. Later, Dr. Ben Peyton, Dr. John Ramsey and Dr. Trudi Volk joined them in developing and editing the more recent editions of the program. Research indicates that most existing Environmental Education (EE) programs stopped at teaching students the facts about environmental problems and issues (Childress, 1978; Stevenson, 1986; Pomerantz, 1990-91). This made the students aware of environmental problems and issues, but did not give them any tools to participate in solving these problems and issues. These educators therefore set their task to develop a curriculum program that will together with giving learners factual knowledge, also equip them with skills for participation in issue resolution. They believe this is the only way by which learners can become involved in solving environmental and STS related issues. To effectively meet its goal, this program has been divided into four goal levels that have been found to correspond with the EE objectives stipulated at the Tbilisi Conference. These goal levels are:

> GOAL LEVEL ONE - ECOLOGICAL FOUNDATIONS:
> This deals with the factual scientific knowledge that the learners must acquire to be able to understand environmental problems and their causes. It would include topics such as the environment, ecosystems, biomes, communities, populations, food chains, energy levels and all other basic ecological facts. These can be taught using regular

class text books and other available materials in class lectures. When learners understand these, they would be ready to delve into what constitutes an environmental problem and/or issue.

GOAL LEVEL TWO - ISSUE AWARENESS:
Here the learners are taught to be able to understand and differentiate an event from a problem and an issue. They are exposed to the myriad of current environmental problems and issues that plague the world. Information for this can be gotten from newspapers, journal and magazine articles, films, video tapes of relevant news programs, the internet bulletin boards, regular textbooks and other library sources. The learners are also taught to clarify values and analyze issues into the players, beliefs and values components.

GOAL LEVEL THREE - ISSUE INVESTIGATION AND EVALUATION:
With the knowledge of issues the learners have gained, they are ready to choose one that they are really interested in to investigate. They are taught how to write issue statements, research and instrument questions, identify a population and choose a sample from it, and also data collection and interpretation techniques. Writing conclusions, making inferences, and recommendations are important skills also taught. With these tools acquired they can develop questionnaires, opinionnaires and interview questions and administer them to their samples. When their data are collected they interpret them, write conclusions, make inferences and recommendations on how to resolve the chosen issues.

GOAL LEVEL FOUR - ACTION STRATEGY:
From the recommendations that the learners make, they are ready to actually participate in actions to solve their chosen issues. Next they do an action strategy which requires them to pick an appropriate action from those they have learned and run it through an action analysis criterion checklist. If they are convinced they have the right action that can resolve the issue and they can and want to implement it, they can go ahead with the implementation. It should be noted here that the instructor never requires or forces learners to take any action. Being a skills and content curriculum, the IEEIA warrants the use of a variety of teaching strategies. In goal level one that deals principally with the acquisition of ecological concepts, the concept attainment, the learning cycle and/or the advanced organizers teaching strategies can be applied. The other three goal levels are mostly for teaching and learning skills. In these cases, teaching strategies for developing skills such as mastery learning, cooperative learning and role modeling can be very applicable. Needless to say other relevant teaching strategies not mentioned here exist and can be used successfully to teach this program.

The very nature of the IEEIA curriculum implies the utilization of authentic assessment . If the major aim of the program is to have students participate in solving environmental problems, then they must elucidate some particular practical behaviors in line with this goal. Assessment and evaluation therefore must measure those practical behavioral outcomes. To prove that they have mastered the skills entailed in investigating environmental issues, the students must successfully investigate an issue, and report their findings. Compiling an issue notebook or portfolio is indication that the students can use the library and other sources to gather secondary information.

The IEEIA program is an interdisciplinary program that can be used in all fields of study. It has different modules that can be used at different school levels with different age groups. For an EE program to succeed in its goal of forming a responsible citizen who will participate in solving STS and environmental problems and issues positively, the program must be made part and parcel of the learners' daily life. For this reason, the IEEIA can begin from kindergarten right up to college level. Research by Ramsey and Hungerford (1989), Ramsey (1991), and Culen (1994) indicate that elementary and middle school students using this program behaved more responsibly toward the environment than those students of the control groups who did not use the program. Newspaper articles from teachers and students using this program also testify to the fact that the program has empowered them to take part in solving environmental and STS issues in their communities.

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Environmental Education: Who Should Do It? The Issue of Academic Training

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This presentation, like other major features of this conference, concerns the issue of what training should be expected of persons who "do" environmental educating; that is, deliver educational presentations to the greater public in schools or otherwise. Administrators operating nature centers, environmental foundations and political action groups, environmental museums and camps, environmental societies, etc. should ideally have the same training. Today, most professions properly set minimum standards for service; accountants, massage therapists, pharmacists, physicians, real estate brokers, almost *ad infinitum*. Public school teachers are included even though their profession receives far less societal respect and support than is appropriate. Why should a person professing to be an environmental educator be exempt?

Few of us doubt the justification and need for professional standards. A primary mission of NAAEE is to "...contribute to the professional development of environmental educators...". One keynote speaker asks if the challenge to environmental education (EE) is literacy or values; two symposia focus on environmental literacy and criticisms of EE. Literacy concerns whether or not we who do the environmental teaching know what we should know about the ecosystem, which is understood by scientific study. We are told in a recent EE Advocate (1995, Summer, p. 4) that a major criticism has been harsh, that EE lacks a foundation in science, that we are scientifically illiterate. It is my experience that too many of us are, if not illiterate, far from adequately trained for the role we assume.

Therefore, I offer studied opinions about the qualifications and background that I believe should be required of a good environmental educator facing today's challenges. I define myself as a professional ecological and wildlife educator, not just an environmental educator, and, thus, I speak most relevantly to the issues and details of teaching ecological and wildlife principles and values. We are here to talk about "building on experience". The question is, what formal educational experience truly makes an environmental educator "professional"? For many of us this touches delicate sensibilities, but no field of academic and educational endeavor ever matured if the truth was not met head on.

Although I have traveled considerably as an ecologist and educator, I make no pretense to being able to offer wisdom to environmental educators from all countries and cultures. I would suggest that those from countries in lesser states of so-called "development" than the USA be certain that you model your education programs after ecologically professional examples.

My Perspective

Thirty-two years ago I was a bird-watching, neophytic, undergraduate staff member of the Earlham College natural history museum. After I had watched a few museum tours for school groups, the boss said, "you do the next one". Thus, another boot straps volunteer was born. Quickly, however, I realized I needed a broad and in-depth academic training in biology, as well as my enthusiasm and ethics about "saving the earth"; if, that is, I wished to go beyond the amateur level and even begin to approach my potential. Along the road to a Ph. D. in ecology and ornithology, I worked as a park naturalist, served as a volunteer and paid environmental educator, and became and remain active in addressing EE issues in the media. I remained active as an EE volunteer during my 12 years of college teaching (10 of these at colleges claiming strength and prominence in teacher training); developed, operated, and taught in institution-based EE programs; and trained students as docents. I also taught courses in Conservation Biology, Environmental Science (not studies), Ecology, Ethology, Vertebrate biology, General Biology, Biostatistics, ad nauseum.

Ten years ago I melted down into a private, professional ecological educator calling myself Aerie East Environmental Education Programs and Foundation. Annually I've visited hundreds of schools and scores of other audiences in 7 states to deliver presentations to 25,000-30,000 people. My programs are based on important ecological concepts and issues, as well as general wildlife biology (all living wild things, hunted or not). They are presented to students of all ages and adults. The pay is meager, but the feedback is great. I'm often complimented on how I handle students of all ages, and groups of large sizes, so well. I'm often told my programs are the best enrichment ever in a school, though I've earned precisely 0.5 formal college credits in teaching methods.

What makes me a unique EE model, so far as I know, is that I'm a wildlife-ecological scientist with the "terminal" degree, trying to maintain a modest research program and attend research meetings, but also spending most of my "work time" delivering programs rather than teaching others to do so or administrating. As such, I offer candid assessment of the problems we face as environmental educators, specific suggestions of what is wrong with EE, and what we should do to make it right.

By necessity and intent I have not researched exhaustively the literature in EE methods and progress, nor have I been able to attend most recent meetings of EE organizations. Clearly, however, my concerns and assessments are common to many others who have.

Problems in the EE Environment

These start with the state of general and science education, the state of our citizenry, and the rapport of the biological community with the general public. We must recognize the following unpleasant realities. Hold on to your hats, and please believe I'm not a total pessimist.

1. Our public education system and the state of society have produced, as per a highly-respected past national assessment, "A Nation at Risk". The risk continues; just ask William Riley, Albert Shanker, William Bennett, and Janet Reno. Too many schools continue to suffer from administrative over-kill, low budgets, expenditure of resources disproportionately on disadvantaged and disruptive students, discipline and crime problems, poorly prepared students, and grade inflation. The data indicate strongly that these will get worse, especially in large urban areas with all attendant social, parenting, economic, health, racial/ethnic, drug, crowding, etc. problems. What does this say about the quality and training demanded of the people who do EE in schools?

Obviously, they better be good. Unfortunately, our teacher-training programs are also suffering from the above problems, directly, indirectly, or both. So...

2. Today teacher training in science is weak. Many prospective teachers still complete a bachelor's degree with only 2 science courses, and these often lack rigor, as implied in the term, "Physics for Poets". Many teachers, even some who enthusiastically teach science, still do not grasp the essence of science as hypothetico-deductive logic nor its elegant relationship to what the public calls answering questions and solving problems. In other words, teaching EE to most teachers is remedial if it occurs at all. According to a letter by Paula Moore at the Center for Early Literacy in the University of Maine College of Education (1995, *Morning Sentinel*, Waterville, ME 16 Aug, p. 5). "Research Findings over two decades have been clear and consistent: Early intervention is more effectual in preventing school failure and long-term learning difficulties than retention, remediation, or transition grades". Think this might have some disturbing implications about leaving EE of our teachers to remediation by programs like Project Wild and Learning Tree? We should not blame teachers for most of this problem. Many are working diligently and valiantly to strengthen themselves. Many know they have not been properly prepared.

3. Weak teaching by families and schools produces uneducated citizens. For the general public, "...the fabric of reason is being ripped asunder,...scientists and other thinkers continue to acquiesce in the process," as so starkly put by M. Browne, a writer for The New York Times (1995, *Morning Sentinel*, Waterville, ME, 28 Sept, p.4). Strong words! This means a lot of voting citizens are discarding or not acquiring the habits of critical, rational thinking and the accumulated knowledge base that such thinking has produced. Too many citizens believe less in the facts produced by science than in angels, astrology, floating by meditation, scientology, extra-terrestrials who kidnap, probe, and poke us, and in the rantings of talk show hosts and guests. Too many of us think that to "believe" in something makes it true; that a "scientific" way of thinking should be discarded in favor of believing something because we have faith in it or want it to be true. The pressures of "political correctness" do not help. Is it not a bit scary that large numbers of citizens are rejecting the forms of thought that brought them the modern technological world? Is it not imperative, then, that EE be as well delivered and as professional as possible?

The "strong words" also imply "real" scientists rarely make the effort to educate the public on a scale needed in environmental education. This is true. When was the last time you heard neurological biologists and ethologists involved in the issues of capital punishment, euthanasia, gender roles, or hunting as cruelty? How about developmental biologists testifying about the realities of the fetus, abortion, the beginning of conscious thought, and the beginning of human life. Yet when scientists do educate directly, as when the eminent evolutionary biologist Stephen J. Gould testified and wrote as an authority in the evolution–creationism controversy, the gains can be tremendous. Read in *Natural History* magazine "Justice Scalia's Misunderstanding" (October 1987) and "The Struggle for the Schools" (July 1994) if you doubt the severity of the problem of citizen ignorance. How scary is it when a supreme court justice demonstrates gross ignorance of the issues over which he presides, and much more scary when he doesn't recognize his ignorance despite powerful, honest, professional efforts to inform him?

4. Medical scientists, doctors, technicians, chemists, and physicists enjoy or enforce their social status so that they are treated by the public as professionals; respected, listen to, often worshipped and adored. Other biological scientists with equally complicated and lengthy training, especially those in wildlife and ecological management or natural history, are usually

not so treated. For example, in Maine it seems that most "veteran outdoorsmen", as well as some animal rights groups and a lot of politicians, think they know more about things like managing wildlife populations than those "infernal biologists" who get their "learnin outin books". This is not hard to understand. Biologists too often relinquish respect by holding public meetings to get public input on issues like bear or gull population management. When was the last time the AMA held a public input meeting on the best techniques for breast cancer surgery? Considering low respect for biological scientists in environmentally-related fields, why should the public be expected to listen seriously to environmental educators who rarely are scientists, and too often are trained only at the avocational or amateur level, even in science?

5. Today's social-political-economic climate in the USA is about as hostile as possible to EE because it is often resistent to acknowledging humanity's negative ecological impacts on local and world ecosystems and resistent to establishing sound environmental ethics founded on science-based knowledge. In a statement by Richard Wilke, President of NEEAP (*EE Advocate*, Winter, 1994, p.2), we were urged not to turn EE in to a partisan political issue. No need to; it already is in the USA, and now is no time to ignore this or play softball with an opposition that often can be ruthless. The social-political-economic climate for EE is worsening because of a political turn to the so-called conservative, republican, and often religiously-biased right.

The adherents of this turn to the right play hardball, and the most extreme examples are the "Wise Use Movement" and the proposals of "takings" legislation. These represent reinvigorated, but extreme, ruthless, destructive, and some might say unethical and despotic, beliefs about how financial values and priorities should supersede all others, both locally and globally. Some people and organizations who oppose truly-balanced environmental protection and truly-wise resource use will exercise extreme, politically and economically brutal, unethical, illegal, and possibly violent means to encourage business and "development" as never before. They will not smile on the acquisition of environmental knowledge or strengthened EE. Two examples of particular concern; recent political attacks on endangered species (= community diversity) protection, and attacks on the US National Biological Service, our federal government's newly-reorganized premier agency for ecological research.

There you have the rules of the game environmental educators have chosen to play. To call ourselves professional environmental educators, we must make a productive impact on audiences. To make a productive impact, what and how we teach must include an awareness of these nasty realities; with due regard, of course, for audience sensibilities, ages, etc.

The Problems of EE

At best we must admit that the accomplishments of EE are significantly limited. This is not my assessment alone. The media certainly agrees. Ellen Gorman, a Boston Globe editorialist says, "Environment Slowly Disappearing. We are no longer educated about nature and therefore may loose it". (Morning Sentinel, Waterville, ME. 1 Sept. 1995, p. 4.) What she means is true, and, unfortunately, how she misstates what she means reinforces the truth. What she means by environment and nature is natural wilderness and wild species. Ask 10 average citizens to explain if we should: 1. save "the ecology"; 2. save the ecosystem; or 3. save ecosystem quality including its biodiversity. Ask them to define biodiversity and one other environmental term commonly used by the public, "predator". I fear your results will not be comforting.

Maureen Oats, past director of EE at Maine Audubon, got to the problem in 1987. "Thirty years later, environmental illiteracy is still a chronic problem...This situation seems unlikely to change any time soon..." (1987, *J. ME Aud. Soc.* 6:19.) According to my experience, it has not changed. She says we have not developed a consensus on the foundation of EE. Unfortunately, it takes a firm foundation to produce credibility; no wonder the credibility of EE is much too weak. J. Disinger also said it bluntly (1981, *J. Soil and Water Cons.* Jan.-Feb.); one of the biggest weaknesses of EE is its lack of academic respectability. So there it is; there are too few truly professional environmental educators to make EE effective, and respectable, and credible. A similar concern has also dogged the field of wildlife rehabilitation, which often overlaps with environmental education. The big question for environmental educators is simple; in what is it we need more academic respectability and, therefore, training? In other words, what is the foundation?

The Foundation

Generally, EE concerns the relationship between the human species and its biotic and nonbiotic environment; specifically it is about understanding and minimizing the damage done by the human species to its biotic environment and, thus, to itself also. "Itself" is a biological system. Consequently, the foundation of EE is rather simple; an understanding of the scientific basics of biological systems, especially from an ecological viewpoint. The science of ecology has been most elegantly and precisely defined by John Krebs in his ecology textbook as the scientific study of the interactions which determine the distribution and abundance of organisms. For our purposes add a concern for determination of the life quality of humans and selected other organisms.

In the process of EE and the solution of environmental problems, subjects like geology and chemistry are studied only in reference to living systems. They are not part of the foundation. Formal training in educational methodologies is helpful, but inadequate or even harmful if used by an educator inadequately knowledgeable about living systems. It is not part of the foundation. Human sociology and anthropology, economics, and politics are inadequate to understand the environmental stresses of the human population if not coupled with adequate knowledge of how the population functions as a biological system. They are not part of the foundation. Spirituality imparts values, motivates, and inspires, but it is not part of the foundation. Organizations, meetings, and networking are helpful, but they are not part of the foundation.

Within the discipline of ecology are organizational levels of study from natural history/autecology, to populations, communities, and ecosystems. One can specify which of these is of greatest significance. That is the study of population systems, because mankind is a global population, and threats to biodiversity (other species) boil down to threats to species populations within communities. The universal concern, never absent from any EE concern, is the effect or plight of populations, human and otherwise. This cannot be said of any other element that arises as part of an environmental issue.

There is a simple way to reinforce this perception. One only need remember that all environmental problems boil down ultimately to the effects of two factors: the size of the human population and the rates at which the average individual in the population consumes resources and pollutes. These are precisely the factors determining the ecological details that determine ultimately the distribution and abundance, and quality of existence, of organisms.

Why am I so urgently concerned that more environmental educators recognize the need for a foundation in academic ecology? I refer you to my introduction. Frankly I have experienced a disturbing wealth of situations in EE, especially wildlife EE, in which inadequate training was demonstrated. Besides producing low quality education and miseducation, inadequately trained environmental educators retard the rate of maturation of the entire field of EE. Unfortunately, the best that can be said in some cases is that it is better than no environmental education at all, and we should get beyond this situation as soon as possible.

Appropriate Academic Training

One of my past students, a practicing high school science teacher, once told me that my team-taught two-semester course in environmental science should be a core course for all college students everywhere. Of course, I agreed. More to the point, what I would suggest as preparation for general and environmental educators today is the following.

All prospective teachers should be required, at least, to take a substantial course in basic biology. This should be followed in the best of all possible worlds by a substantial course, or two-course sequence, in environmental science, or perhaps environmental studies. There can be a great difference with the former the better choice. Prospective biology or general science teachers should also have a substantial course in ecology. In fact, this is true of any teacher or citizen wishing to call themself an environmental educator in any educational situation. "Substantial" above means that watered down, non-majors course should be avoided.

Anyone wishing to represent themself as, or function as, a wildlife educator has a bigger task. In addition to general biology, ecology, and environmental science should come: one or more of general vertebrate zoology, ornithology, herpetology, etc.; general or field botany, or similar; animal behavior; and evolutionary biology. Some of these, such as ecology and evolutionary biology, might be combined into one course. I am also certain that many educators could validly substitute extensive experience in some of these areas, such as ornithology, in place of course work.

There you have it. In effect, we would be adopting a small element of the book *Dune* (F. Herbert, 1969, Berkeley Books, 278 pp.) as our professional objective; to have the "planetary ecologist" as very important cultural role. Of course, for those interested in other specializations beyond general EE there are other subjects and courses that should be mastered, such as marine biology or oceanography. There are also important concepts or processes at the core of environmental conflicts that all of us should be well-versed in and able to detect. One is the destruction of a "commons" as originally described by Garrett Hardin in "Tragedy of the Commons" (1968 *Science* 162:1243-1248). Another would be the disaster looming in the future if environmental quality and wilderness are repeatedly forced to "compromise" with individual businessmen instead of the human species. A third is the corruption of "externalization of cost" when natural resources are utilized.

The objectives of academic demand and rigor are the same in any case: To give educators breadth and depth; to know more than a little more than their audience and to possess the confidence it generates; to be able to carry on some comprehensive "philosophizing" about their subject matter; to be able easily, authoritatively, and realistically to relate biology to other relevant issues such as oil spills, the role of hunting in human culture, and out-ofwedlock mothers; to have substantial credibility based on the foundation of proper academics; and someday to be able to get paid reasonably for one's service so that one can make a decent living in EE and still do the teaching.

Teaching Kids to Love The Earth: Earth Caring Activities for Youth, Families and Communities

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Abstract

Participants in this conference session will be introduced to activities described in the national award winning book *Teaching Kids to Love the Earth: Sharing a Sense of Wonder*—a collection of 186 earth caring activities for children of all ages. Co-author, Joseph Passineau will assist participants in discovering the origins of their love for the earth by focusing on Rachel Carson's The Sense of Wonder and the environmental legacy of other Earth Prophets and contemporary eco-heros/ heroines. Activities which take youth and families from earth awareness to community and global environmental action will also be illustrated by following the author's *Sense of Wonder Circle*: curiosity, exploration, discovery, sharing and passion. Workshops for families conducted by authors will also be described. Also considered will be applications to programs for diverse audiences including youth, parents, families, teachers, camp counselors, youth leaders, and other caring adults. The book, which has sold over 50,000 copies, was translated into Portuguese for distribution at the United Nations "Earth Summit" in Brazil.

Sharing a Sense of Wonder

> If a child is to keep alive his inborn sense of wonder, he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in.
>
> **Rachel Carson, 1956**

In her perceptive book of the heart, *The Sense of Wonder,* Rachel Carson (1956) wrote about discovering the fascinating world of nature with her nephew Roger as they explored the rugged coast of Maine. She described the sense of magic and wholeness that is nurtured when a child and one caring adult participate in a mutual game of exploration, discovery and sharing.

Carson often let Roger's curiosity guide them as they searched for little creatures of the night, explored the tidepools rich with life, or simply watched the awe-inspiring galaxies twinkle above them. She considered the fresh view of a child awe-inspiring:

> If I had influence with the good fairy who is supposed to preside over the christening of all children, I should ask that her gift to each child in the world be a sense of wonder so indestructible that it would last throughout life, as an unfailing antidote against the boredom and disenchantments of later years, the sterile preoccupation with things that are artificial, the alienation from the sources of our strength.
>
> **Rachel Carson, 1956**

Carson viewed this inborn and life-long gift of wonder as a powerful force essential to maintaining personal, societal and environmental wellness. To exercise this life giving force, she suggested a simple recipe—nurture the companionship of a child, and together explore the beauty and intricacy of the natural world. In the process, the strengthening and healing forces of a" sense of wonder" will grow within child and adult alike.

Carson felt the role of the adult was to simply keep alive that sense of wonder by sharing it. Although she was certainly capable as a biologist and author of *Silent Spring* (Carson 1962; Brookes 1972), of naming all the plants and animals that she and her nephew Roger discovered, she did not believe that the caring adult needed any particular skill or knowledge to foster that sense of wonder. Instead, as noted in the following quotation, she sought to empower parents and teachers by emphasizing the intuitive, the emotions, and the inborn strengths of both parent and child.

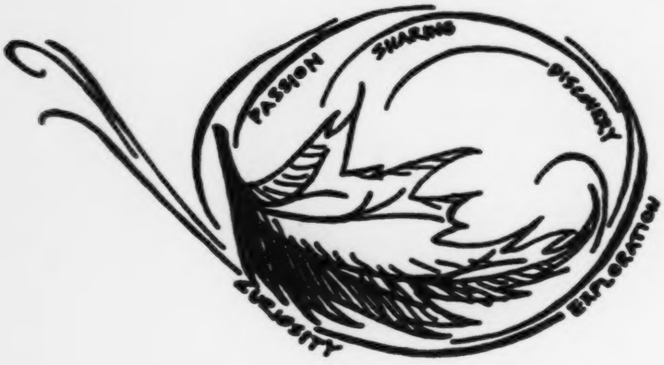
> I sincerely believe that for a child, and for the parent seeking to guide him, it is not half so important to know as to feel. If facts are the seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the fertile soil in which the seeds must grow. The years of early childhood are the time to prepare the soil. Once the emotions have been aroused—the sense of the beautiful, the excitement of the new and the unknown, a feeling of sympathy, pity, admiration or love—then we wish for knowledge about the object of our emotional response. Once found, it has lasting meaning.
>
> **Rachel Carson, 1956**

Teaching Kids to Love the Earth

Inspired by Carson's book *The Sense of Wonder*, three friends and I have developed a philosophy and style of teaching that is designed to help keep alive an inborn sense of wonder about the natural world. To share our commitment to family wellness and environmental education, we have over the past decade conducted "Sense of Wonder Workshops" for families throughout Minnesota and Wisconsin at places like the Wolf Ridge Environmental Learning Center, the Audubon Society's Hawk Ridge Nature Reserve, the YMCA's Camp Manitowish and the Central Wisconsin Environmental Station of the University of Wisconsin-Stevens Point.

As an outreach of our teaching efforts, we created *Teaching Kids to Love the Earth: Sharing a Sense of Wonder* (Herman, Passineau, Schimpf and Treuer 1991) which was published by Pfeifer-Hamilton Publishers, Duluth, MN. *Teaching Kids to Love the Earth* is a collection of 186 earth-caring activities designed for use with children of all ages to help them experience and appreciate the earth, and, thereby, foster their inborn sense of wonder.

The book leads you, as do our workshops, through what we call "The Sense of Wonder Circle": curiosity, exploration, discovery, sharing and passion. In short, as you participate in these activities with children and friends, the experiences will awaken your **curiosity**, lead you to free flowing or planned **explorations**, which will foster **discoveries** about yourself and the world around you, and inspire you to **share** your discoveries and sense of wonder with others. Ultimately, these experiences will help lead you and those you love to care **passionately** for the earth.



Sense of Wonder Circle

From the perspective of goals in environmental education, the activities within the book foster not only environmental awareness and sensitivity, but guides parents, teachers and children to knowledge, attitudes and values, skill development and environmental action. The activities selected also span the age levels from toddler to adult. Some of the chapters on curiosity and exploration focus, for example, on playfully fostering a child's imagination, sense of adventure, and interest in learning outdoor skills. In contrast, the three chapters focusing on "passion" encourages the adult reader to (a) create visions for the earth and preserve them, (b) fight for environmental concerns, and (c) develop lifestyles based on a passionate caring for the earth.

In addition to illustrating the steps of the Sense of Wonder circle, each of the 17 chapters contains a story from the lives of the authors to portray the main activity and to bring to life the feelings and emotions that Rachel Carson believed were essential to environmental literacy (Brooks 1971). We have also included "Did you Know" and "Other Ideas" sections in each chapter to help you plan your own adventures. The "Resources" section of each chapter also lists selected books and other guides to help the reader better understand and expand upon the activities. As such, *Teaching Kids to Love the Earth* complements the messages of related books such as *Sharing Nature with Children* (Cornell 1979), *Hug a Tree* (Rockwell, et al. 1983), *Humanizing Environmental Education* (Knapp and Goodman 1986), *The Kids Nature Book* (Milfred 1989), *Keepers of the Earth* (Caduto and Bruchac 1988) and references many excellent children's books such as a *Time of Wonder* (McClosky 1989), *Owl Moon* (Yolen 1987), and *Walk When the Moon is Full* (Hammerstrom 1975).

The legacy of other "earth prophets" is also woven into the fabric of the book. There are references to the ideas and words of Rachel Carson (1956), Sigurd Olson (1956), Aldo Leopold (1966) and John Muir (1965), whose commitment to the earth and beautiful words spoke to our hearts and moved us to share our feelings for the earth. The book, which is attractively illustrated and easy to use, is designed to enable the reader to share their own sense of wonder with others and to foster a love for the earth and a commitment to passionately care for it.

Participants in the workshop session will be encouraged to consider the origins of their sense of wonder, to participate in activities included in the book, and to design their own activities using the "Sense of Wonder Circle" as a guide. The sessions will also demonstrate the joy of exploring, discovery, and sharing in a natural setting. Participants will learn how to integrate environmental awareness and earth caring activities and lessons into their personal lives and work related efforts with youth, parents, families, teachers, camp counselors, youth leaders, or other caring adults.

In summary, the "sense of wonder" as portrayed in Rachel Carson's book is a powerful force within each of us. Shared and nurtured within one another, this force can be viewed as a key to personal, family, societal, and environmental wellness. Through activities included in *Teaching Kids to Love the Earth*, we hope to foster this magical and health sustaining force in all as they care for the earth and each other.

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Strategies for Improving Cross-Sector Communication in Environmental Education

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National Environmental Education and Training Foundation (2)

Introduction

The National Fish and Wildlife Foundation (NFWF) and the National Environmental Education and Training Foundation (NEETF) hosted a roundtable discussion on improving cross-sector communication. This was the fourth in a series of roundtables sponsored by NFWF and NEETF on critical issues in environmental education. The goal for the session was to identify and prioritize strategies for improved cross-sector communication.

Definition of Terms

In the phrase "cross-sector communication," the term "sector" was intended to cover several dimensions. Initially, the environmental education field is composed of representatives from different types of organizations, such as non-profits, government agencies, schools, academic institutions, foundations, corporations, clearinghouses, and the media. Practitioners within one type of organization, such as non-profits, tend to communicate with each other extensively, but have less contact with representatives from different types of organizations, such as government agencies or corporations. Another aspect of "sector" involves participation in environmental education—multicultural, bipartisan, intergenerational audiences without limitations on gender, socio-economic status or physical or mental challenges. A final aspect of "sector" involves a spatial dimension, moving among the local, state, national and international levels, to urban, suburban and rural communities.

Background from Prior Roundtables

NFWF and NEETF sponsored three prior roundtable discussions on evaluation, the role of technology in environmental education, and delivery systems for environmental education materials and programs. The roundtable discussions were an open forum for a small number of representatives with different perspectives from diverse sectors of environmental education to share ideas and formulate strategies for improving the field. All three discussions identified cross-sector communication problems inhibiting improvements to the field.

Evaluation

Academics have developed extensive tools and methods for conducting program evaluation, but most practitioners are not applying them. Dissemination of results is often left out of objectives and therefore out of the evaluation component of most programs. The deliberate failure to communicate was also noted, for fear of revealing shortcomings to funders and possibly losing out to competing programs that only report their successes.

Technology in environmental education

The developers of much of the "environmental education" software are not communicating with the academics and educators involved with environmental education to make the software meet actual objectives for the field. Technology-based programs are often designed by organizations without knowledge of the resource and infrastructure limitations of the schools that are the ultimate targets for these programs. Used correctly, technology offers untapped potential for improving cross-sector communication .

Delivery systems

The lack of communication within the field was repeatedly identified as the source of redundant development of environmental education materials. Pre-service education was highlighted as a sector that is not currently being reached by environmental education. The effectiveness and the tensions of partnering to use existing dissemination networks was also raised.

Roundtable on Cross-Sector Communication

With these issues in mind, approximately forty-five representatives from all sectors of environmental education engaged at NAAEE in an open discussion of goals for cross-sector communication, identifying barriers and incentives for meeting these goals. Using small and large facilitated group discussions, participants identified benefits of cross-sector communication, challenges that keep the field fragmented, and strategies for improvement.

Goals for Cross-Sector Communication in EE

Content goal

The most prevalent theme was improvement of environmental education through shared knowledge; goals included adoption and broad dissemination of definitions, knowing what does and doesn't work, and long-term evaluation.

Implementation goals

Coordination among practitioners leading to best use of available resources was another theme, with goals to eliminate unnecessary redundancy, link similar programs across the country, and integrate projects "like a healthy ecosystem." Integration of EE with education reform, and community involvement in EE were also desirable.

Support goals

The third goal sought coordinated funding strategies and sustained program support in place of shifting priorities that initiated but rarely completed projects.

Barriers to Cross-Sector Communication

Actions in isolation

The lack of "big picture" or systemic thinking was seen as a significant challenge, with concerns that people still argue over definitions rather than roles, focus on programs rather than infrastructure, and communicate minimally with one another.

Swimming upstream

Comments focused on environmental education's lack of integration with other educational fields and professionals; one person described it as a preference among environmental educators to be "outside the mainstream." When practitioners are unaware or unconcerned about the field's image to others, or when environmental educators don't know the audiences they seek to educate, mistakes are made that threaten environmental education's credibility. The lack of political mandates was also seen as a barrier to disciplinary integration and recognition.

Mixed messages

When environmental educators do not speak with one voice, the lack of standardization can leave people outside the field confused. Several people felt that the goal of consensus or nothing was now in itself a barrier, preventing people from taking leadership and making needed decisions that could bring coherency and unity to environmental education.

Incentives to Cross-Sector Communication

Participants identified fewer but more comprehensive ideas, seeing many of the goals listed earlier as incentives in themselves.

Improved implementation

Increased effectiveness through work made easier, and efficient resource use by avoiding duplication and saving dollars for dissemination were solid front-runners.

Better outreach

Diverse perspectives enrich materials and increase environmental education's capacity to serve more people. For outside audiences, cross sector communication can expand connections yet allow environmental educators to maintain control over content.

Resources for Cross-Sector Communication

Professional affiliations

NAAEE, its affiliates, and long-standing programs such as Projects WILD and Learning Tree are resources both for their infrastructure and their shared history of successes and failures. New people to the field are a challenge—how to get everyone up to speed—and an asset, bringing innovative approaches to old issues. Associations of environmental professionals—within and outside of the education field—are an untapped resource, as are commodity organizations in rural areas.

Successful track record

The content and methodology of "good" environmental education is a primary resource for reaching people interested in the environment, education, or both. Success stories are a resource that show what EE is capable of and provide people a platform on which to build.

Communication tools

Technological advances like e-mail, the Internet, and interactive television greatly enhance capabilities for cross-sector communication. The benefits of traditional communication media—newsletters, personal phone calls, professional publications—were also noted.

Supporters

Philanthropic, corporate, and government funders are financial and technical resources. Studies by Pew, Heinz, and Kendall were cited, as was *pro bono* work provided to EE organizations by marketing and planning firms. The National Environmental Education Advancement Project (NEEAP) and the EPA training grant recipients were also acknowledged for their emphasis on building capacity.

Several underlying principles for effective cross-sector communication were brought forward. Communicating—and listening—to needs and resources openly was considered critical, as was flexibility to accommodate needs of others. The need to know the audience and build trust was also acknowledged, as was the importance of the right mix of stakeholders willing to share common timelines, perspectives, and resources.

Strategies For Increasing Cross-Sector Communication

Strategies are needed at several levels, with one set of ideas as important as another.

Leadership within the EE field

NAAEE should take leadership in fostering cross-sector communication. Orientation for new NAAEE members and "new member-friendly" meetings were encouraged. A comprehensive communication strategy, a national-level communication "hub" perhaps generating PSA's through an Ad Council partnership, leadership training in cross-sector communication, and a review of materials and programs to determine whether more are needed were additional roles suggested for NAAEE. Regional affiliates meetings, encouraging participation by sponsors and co-sponsors, were also recommended.

Leadership from EE funders

Funders were asked to reconsider environmental education's financial needs and encouraged to adopt 3–5 year timelines that allow both a pilot phase and full program implementation. Consistent program support could give people time to build relationships across sectors, facilitating communication and reducing inadvertent redundancy. Funders were asked to share information about EE programs and supporters; ideas included a database of grant successes and failures and a requirement for grantees to mentor new grantees. Funder collaborations, support for demonstration sites, and a handbook for matching grants were other strategies recommended for funder consideration.

Personal leadership

Each person can pick up the telephone and talk to someone. Strategies included attending environmentally-focused professional and corporate meetings to represent environmental education, working more directly with private businesses, and engaging in honest exchanges of needs and resources. Learning how to locate common ground and foster "safe havens" for cross-sector communication was also recommended.

Planned Use of Results

In addition to sharing this report among participants, NEETF and NFWF are using the results to revise their own grant-making criteria. Findings will be disseminated to other funders of environmental education and training projects, and reported in articles in professional and trade journals and through talks and presentations. Several follow-on products including a key to evaluating environmental education grant projects and a developers checklist for technology-based environmental education are also planned.

Environmental Citizenship and Political Controversy: The Challenge of Bringing Analysis of Public Policy Issues into Environmental Education

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The Problem

At a time when environmental protection in the United States is politically embattled as never before in the past 25 years, should EE be "laying low" until the smoke clears, or is teaching environmental citizenship—including policy analysis examining social and economic causes of environmental problems—an important continuing role for EE in our society?

To put the question in perspective, what would we think about this proposal:

- Resolved - Environmental education should avoid current issues of national environmental policy debate.

The presenters—an educator who in personal terms is an avowed environmental advocate, and a senior staffer of an advocacy organization—both argued that environmental education should not be one-sided, but that EE does have an important societal role to play in teaching students how to explore and analyze active public policy issues.

The Current Political Context

Internationally there is currently a heightened awareness of important environmental principles—including Sustainable Development, active environmental citizenship, and comprehensive accounting of environmental costs and alternative technologies—as reflected at the Rio UNCED in 1992, echoing the themes of earlier environmental education international convocations at Belgrade and Tbilisi.

But here in the United States a powerful anti-environmental campaign founded upon the Timber, Mining, Grazing, and Real Estate industries has been successfully attacking major environmental protection programs. The Endangered Species Act, rangeland and mining reforms, Clean Water Act enforcement, and a host of other accomplishments of the past 25 years have been stalled and face reversal in a hostile Congress and some state legislatures. EPA's budget is proposed to be cut 30%, with enforcement cut 50%.

All this has been occurring despite the fact that polls show the people of America continue to support stronger environmental protection initiatives (a public awareness attributable in part to EE and the informed debate it has created).

EE inevitably has become a target as well. Federal environmental education funding—a major source of support for many EE initiatives nationwide—faces significant cuts or elimination with the political winds that now are blowing. In Arizona, an industry strike force of the so-called "Wise Users," with a budget of hundreds of thousands of dollars, defeated an EE initiative. That assault will continue; a contingent from that well-financed industry coalition is appearing at this convention. "Are Schools Turning Our Children into Eco-Activists?" demands a screed condemning the teaching of recycling and citizen involvement in pollution law enforcement. (Holt 1991). Glossy materials by the ton are distributed by the timber industry and its resource extraction allies for use in K-12 classes, downplaying recycling and resource conservation, and arguing that market practices are benign. Teachers have reported complaints about "partisan advocacy" when they attempt to examine the interrelated ecological consequences of industry actions.

In the circumstances, one defensive strategy for EE might well be to "lay low," avoiding public policy issues, and attempting to achieve innocuousness.

EE sometimes seems to have chosen laying-low. Our conferences are now sponsored by some of the same industries that are attacking environmental protection in government. If we are accepting their patronage in the wistful hope that they will hear our ecological-awareness perspective, our conferences do not generally provide that opportunity. Most conference presentations focus on localized biology and abstracted relationships between people and nature. Materials and analysis on the most important environmental policy issues our students hear on the daily news—resource depletion problems and alternatives, endangered species and habitat destruction, toxics and pollution prevention, etc. —are not readily visible or featured for curriculum development. As one member of the audience said, faced with "Wise Use"-type criticism against "advocacy" in the classroom, it is often safer just to avoid controversial subjects.

In these circumstances, it would be troubling if EE is being induced to avoid the teaching of environmental citizenship, "controversial" issues, economic and political analysis of causes of environmental problems, "activism" and citizen participation in civic debates.

Summary of Discussions

- EE has an important civic, societal role to play, in teaching thoughtful environmental citizenship, analyzing causes as well as effects.
  - EE is not just about studying biology. If EE does not teach citizens how to make informed civic analysis of environmental policy issues, what institution in our society will?
  - Picture a safely uncontroversial EE class, K-12, studying endangered species at a wetland bog: the class would study the bugs living in the bog, but would not consider the bulldozer filling in the bog, the manifestation of why wetland habitats are disappearing. Without an overview of causes, and alternatives, the analysis is hardly useful. (Plater 1995).
  - If EE only examines particular ecological features, in science terms alone, avoiding consideration of societal causes and cumulative effects, it may appear more "uncontroversial," but it abdicates a role that is as important to its society as it is to the integrity of the profession itself.
- EE has to be careful in order not to be branded as "partisan advocacy."
  - Teachers and programs are vulnerable to political repercussions when they are perceived as taking positions on public controversies.
  - Cases where EE teachers have been one-sided messengers, conveying advocacy positions with narrow zealotry and sometimes inaccurate information, however, do not discredit the fundamental process of teaching students the techniques of informed analysis, but rather emphasize that it must be done in a comprehensive, balanced, and not preclusive manner.
  - If students are not confronted and trained in analyzing on-going issues of public policy debate, then EE—far from avoiding political positions—takes, in effect, a partisan

position in favor of the simplistic anti-environmental views that dominate current national political rhetoric.

- The demanding role of teaching balanced, incisive inquiry into policy issues is eminently do-able if we apply ourselves.

Peter Shelley of the Conservation Law Foundation presented an environmental science and policy analysis in a highly political regional controversy - the crash of fish populations due to overfishing in the Gulf of Maine. CLF is an avowed environmental advocacy organization, but the materials it prepares for schools sympathetically present both sides of public policy debates, including important data on ecology, economics, politics, and avoidance of polarization. Its materials on overfishing demonstrate the important role of educating students and other citizens about the ecological complexity of fisheries, the human cause of fish population crashes, the political dominance of the fishing industry's economic drives, and an empathic view of the commercial fishermen who are economically locked into their role.

Students reviewing materials prepared on such an issue should hear probing analysis of both sides of the debate, recognizing that there is no easy answer, but should be in a position to develop and analyze rational policy alternatives that can result in better solutions for the society.

Preparing such materials takes hard work and balance, but they do exist, and the job of teaching balanced, incisive issue analysis is do-able.

- EE has to worry about accurate information, because misstatements about data can discredit the educational enterprise.

To ground sound analysis, and to avoid discreditation of EE's work, the best information available must be sought and examined, while reminding students that data constantly changes and conclusions must be flexible.

Good information often turns out to be controversial, however. Take the Spotted Owl and the clearcutting of national forests - In a world where political decisions are often made on simplistic sound-bites—"what do you want owls or jobs?"—solid analytical information like consideration of clearcutting's public subsidies, or its effects on erosion, downstream sedimentation and salmon spawning, is considered controversial.

Current politics reflect simplified, industry-dominated presentations of the benefits of industrial processes, without full consideration of economic and ecological consequences. Learning how to do a fuller analysis of the elements of public policy debate is critically important to environmental citizenship.

- EE should include analysis of timely, relevant issues of current environmental policy debate.

There are always issues in the news that EE could develop into instructive policy inquiries: the Spotted Owl and clearcutting, opposition to recycling, James Bay hydrodevelopment, attempts to reform the Mining Act of 1872 or to normalize grazing fees on public lands, and the like. Yet often EE does not explore such current issues.

What should we be doing? In teaching how to analyze public policy issues, EE classes at all levels can choose to explore one or more active public policy issues each year, to demonstrate the relevance and craft of civic environmental analysis to our students.

Especially at higher grade levels, EE should include understanding of the legal and governance systems of our society, to show students how environmental citizenship can be actively integrated into public policy debates.

EE must avoid narrow partisan advocacy, but not to the point of failing to confront policy debates and controversial issues. "Laying-low" is just as political a choice as "advocacy."

EE must define and fulfill its role in the active middle ground between the two extremes. If we in EE are to fulfill our societal role, we must do it all: teaching analysis of ecological data, economic cause and effect, politics, political sophistication and skills, policy choices and resolutions, and developing and utilizing materials that embody the challenges and rewards of environmental citizenship.

EE's role is more important now than ever for the civic "environmental citizenship" education of present and future generations, not to mention for policymakers and the media, and for the long-term sustainable development of our society.

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From Snails to Alpha Males: Planting the Seeds for a New Environmental Ethic

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Overview

The *From Snails to Alpha Males* Project is a collaboration between The Jane Goodall Institute's Roots & Shoots Program and the 4-H Science Experiences and Resources for Informal Education Settings (SERIES) Program. The project involves the modification, development, and piloting of curriculum materials for use initially at Green Chimneys, a residential educational facility; and subsequently, a wide variety of school and community-based educational programs. The project will provide children and their teen-age and adult leaders with interdisciplinary, hands-on activities. The materials developed as part of the *From Snails to Alpha Males* Project will be designed to be useful in both school-based and informal educational settings. Some of the materials developed by the project will draw heavily from existing 4-H SERIES and Roots & Shoots materials; new activities will also be developed. Pilot testing will be conducted in California, Connecticut, New York, and Quebec, Canada.

Background and Need

We know that early experiences are critical influences on children's attitudes, behaviors, educational attainments, and vocational interests. An example of a parent's encouragement comes from Nobel Laureate Richard Feynman. In his final book, *What Do You Care What Other People Think?* Feynman begins with a chapter recounting how his interest in science was influenced by early inquiry activities with his father. The story of their walks together in the woods, speculating and gathering evidence for possible reasons for the bird behavior they observed is compelling in describing the impact of informal experiential learning on attitudes toward science and the natural world. It is well told by a master physicist and storyteller, and describes an inquiry-based constructivist learning situation taking place between a parent and child. This type of participatory experience is important in promoting the social, emotional, and academic growth of children.

In today's society, the amount of time available for families to participate in educational programs has been impacted by the increasing numbers of women in the work force, single parents, and dual wage earner families. The opportunity for children to interact with significant adults (parents, relatives, neighbors, etc.) or older youth in informal experiential activities that build environmental and scientific literacy continues to be reduced.

At the same time, broad economic shifts have fueled criticism of traditional schooling practices in general. For example, Reich (1983; 1991) has suggested that the United States is no longer dominated by a production-line economy but is rapidly moving toward a dynamic, entrepreneurial, global economy, and that our schools need to provide experiences for learners that are dynamic and entrepreneurial by design. In part, this notion suggests that schooling needs to include more activities that allow students to work cooperatively on the heuristics of problem finding, problem framing, and problem solving.

Additional impetus for entrepreneurial applications of learning to real-world problem solving can be found in the rekindled interest in service learning, which is defined as the blending of both service and learning in such a way that both occur and are, simultaneously enriched by the other. The support of the federal government for this trend toward the blending of learning and service can be seen in the Congressional reauthorization of the National and Community Service Trust Act of 1993, designed to place up to twenty-five thousand participants in national service assignments that include service learning components.

One need only pick up the daily newspaper to appreciate our society's demand for ecological and scientific literacy. With increasing frequency, voters are asked to pass judgment on issues such as offshore oil drilling, the fate of endangered species, and the commercial uses of genetic engineering. Consumers choose, on a daily basis, among products that vary widely in the energy and resource costs used to make, package, and deliver them, as well as their costs in dollars. Employers and employees alike are faced with decisions regarding environmental sensitivity in the workplace. How would increased ecological and scientific literacy affect the way these choices and decisions are made? What role does education, in the broad sense, play in increasing day-to-day ecological and scientific literacy of Americans? And, how do we, as an educational community raise these levels of literacy among all segments of United States' citizenry?

Resources provided by each of the three collaborators

The *4-H SERIES* (Science Experiences and Resources for Informal Education Settings) Project is a program featured within the National 4-H Youth Development Program for improving the science literacy of American youth. The overall goal of the 4-H SERIES program is to increase both the quantity and quality of ecology and science experiences available to youth in a way that develops a clearer understanding of how this relates to their everyday lives. Specifically, the program aims to: 1) provide interesting, accurate, hands-on "sciencing" experiences that include learning the operational processes of science (observing, communicating, comparing, organizing, experimenting, inferring and applying); 2) engage teen leaders in delivering SERIES activities to young children; and 3) encourage each youngster to use the process and approaches of science to address and work toward solution of ecology and/or science related community issues.

Initially funded by the National Science Foundation in 1987, the 4-H SERIES program now offers eight curricula. Each curriculum uses a cross-age teaching strategy with volunteer teens leading younger youth in hands-on inquiry activities. Each of the curricula have ecological implications, and each is geared toward youth participating in community service applications of what they learn. During 1994, 4-H SERIES is estimated to have had more than 70,000 youngsters participating in its program in 42 states and Puerto Rico.

Roots & Shoots is an ambitious new program of The Jane Goodall Institute in Ridgefield, Connecticut. Roots & Shoots is dedicated to teaching youth members to observe and understand the world around them while becoming actively involved in environmental and humanitarian issues. Youth learn the interconnectedness of all life on earth, and, above all, realize the great importance of each individual's worth as they join hands for a common cause. Roots & Shoots groups currently exist in 28 U.S. states and 23 foreign countries.

Roots & Shoots exists to help young people to: 1)Value themselves, each other, and all living things; 2) Become aware of their own relationship to the earth; and, 3) Take action to make the world a better place. Roots & Shoots activities for school and community-based programs are designed to teach members to take a hands-on approach to learning and reach beyond the walls of the classroom. Interdisciplinary, inquiry-based educational materials are currently being developed; teacher training workshops are available. Roots & Shoots activities and educational materials are designed to help young people learn to: 1) Observe and investigate the world around them; 2) Identify and understand local and global problems; 3) Create solutions; and, 4) Implement effective plans of action.

Green Chimneys. It is Green Chimneys' mission to provide care and concern for all living things. Green Chimneys is a voluntary, non-sectarian, multi-service agency dedicated to the development of basic living skills for children and adults in order to strengthen their emotional health and well-being. The agency's main offices are situated on a 150-acre farm 60 miles north of New York City. Its quiet rural setting provides an environment conducive to learning and rehabilitation. On their main campus children and adults are able to experience the therapeutic value of animals and plants.

The collaborative work being undertaken by the 4-H SERIES Program, the Roots & Shoots Program, and Green Chimneys provides an ideal base to accomplish the goals and objectives of the *From Snails to Alpha Males* project. The 4-H SERIES project provides technical assistance and a history of successful development of community-based ecology and science curricula and training program. 4-H is national in scope with university trained and employed county personnel in virtually every county in the United States and its territories. The Roots and Shoots Program benefits from the more than 35 years of continuous field studies conducted under the direction of its well-known founder. Jane Goodall's studies of chimpanzees in Gombe Stream National Park, and her dedication to the environment are an inspiration to the *From Snails to Alpha Males* project. The Green Chimneys campus and affiliated facilities provides an ideal environment to pilot the *From Snails to Alpha Males* project materials and instructional techniques.

Approach

A look at current education reform literature suggests that a program that aims to be effective should recognize that children: 1) are active learners who "construct" an understanding of the world; 2) learn best with real-world examples and connections; 3) learn best through direct "hands-on" experience (and not through the memorization of endless "factoids"); and 4) learn through positive experiences with older children and adults.

The *From Snails to Alpha Males* Program goals and objectives are: 1) Develop several units of study consisting of hands-on, simple, easy to use, and fun sets of activities targeted primarily for children 8-12 and youth ages 13-18 using the successful curriculum revision strategies of the 4-H SERIES project. These activities will engage the child and youth participants in cooperative problem finding, developing a solution strategy, and assessing the outcome of their solution in school and community settings. These activities will be led by specially trained teen and adult volunteer leaders; 2) Develop a model program for ecological and scientific literacy which enhances a sense of community for the participants; and, 3) Establish strong collaborative relationships (particularly with those reaching underserved and minority populations) to elaborate and disseminate the *From Snails to Alpha Males* program through national and international networks. The materials being adapted and developed by the *From Snails to Alpha Males* Project may best be viewed more as a "tool to be used" rather than a "curriculum to be adopted."

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Strategies for Enhancing Environmental Perception

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Introduction

Recently our research group has been experimenting with an interdisciplinary model in environmental education for sustainability in primary school. The purpose of this experiment was to use the following interventions in order to help children adopt an environmental behavior by inviting children to:

1) Perceive their environment for the purpose of appreciating it, criticizing it, knowing it. (Connect with their environment)
2) Share with others their emotions, knowledge and values about this environment.
3) Develop a vision of this environment for the future.
4) Act to improve this environment or to better use one of its resources.

In 1994-95, the research project *Strategies for Enhancing Environmental Perception in Children* was initiated and it was decided that the first two steps of the previous model should be explored further. The goal of our research was to experiment with pedagogical methods aimed at increasing children's ability to see, feel and develop a personal vision of their environment. Designing affective strategies to connect children with their environment was of primary interest. It was believed this connection with the environment would motivate them to engage in environmental action.

Conceptual Framework

In order to discover various methods to enhance environmental perception in children, literature relating to three main concepts was explored: *perception*, *environmental sensitivity*, and *sense of place*. These three concepts are closely linked to environmental perception. *Environmental sensitivity* can be defined as:

> a feeling of empathy towards the environment manifesting itself as habits and attitudes of openness, interest and vigilant attention to the components of a milieu, and as a skillfulness in perceiving and experiencing these components (Pruneau, 1994, p. 10).

Environmental sensitivity is developed moreover in childhood, by regular and solo (or with just a few people) visits in natural settings and by the influence of parents or friends also sensitive to the environment (Tanner, 1980; Sivek, 1987). The *sense of place*, a concept born of cultural geography, is a relationship between a person and a place. It is "a feeling of belonging and attachment to a place" (Hay, 1988, p. 22). The sense of place can be expanded through regular exploratory visits in the environment and with involvement in the community.

In literature related to perception, it was discovered that emotions can influence perception. Gibson (1977) defines perception as a direct gathering of information (by the senses) and he proposes the concept of *affordance*. This concept means that when people look at a particular landscape, they always tend to think about what this place can offer them. Would they like walking on that ground? Would they meet attractive people at that place?

Thus, we decided to use these affective approaches to teach children to look at the various places in their milieu and to reflect upon what those places can *afford* to them. The purposes of the 24 pedagogical interventions examined in the literature and experimented with the students were to help children appreciate and critique the different areas in their environment. It was believed these affective experiences could increase their perception skills. The 24 pedagogical interventions experimented with were the following:

1) Before exploring the environment, create a state of mind that will facilitate open-mindedness and wonder. Prepare them to see (Gray, 1985).
2) Visit many different places and ask children to compare the landscapes (Adams, 1991).
3) In the environment, use many senses, particularly those favouring long term memory retention: senses of touch and hearing (Porteous, 1990).
4) Allow them to explore and play (Stewart, 1994).
5) Start with lively activities and progress to a slower mode to favour centration (Steele, 1981).
6) Serve as a model: manifest commitment and wonder (Gray, 1985).
7) Make use of the spirit of place: create a particular atmosphere (Steele, 1981).
8) Tell or read ecological stories (Johnson, 1991).
9) Plan solos (short times passed alone in a setting) (Kaplan and Kaplan, 1989).
10) Have them reflect: about what they feel in their surrounding or about their behavior towards this environment (Adams, 1991).
11) Go back many times to the same location (Hay, 1988).
12) Have them choose an identifying element (Legault, 1989).
13) Allow them to engage in systematic observation and critical viewing (Adams, 1991).
14) Exploit the current season and elements present in the visited place (Gray, 1985).
15) Have them realize a significant and pleasant experience (Gray, 1985).
16) Help them become aware of their environment's uniqueness (in time and space) (Stolp, 1993; Lutts, 1985).
17) Use native rituals (Horwood, 1983).
18) Have them know the typical natural elements of their own environment: types of soil, native plants and animals... (Stolp, 1993).
19) Exploit special places and refuges (Nabhan, 1994; Sobel, 1993).
20) Use magic and adventure. Base each fieldtrip on a particular theme and focus all the activities on this specific theme (Van Matre, 1990).
21) Avoid overloading fieldtrips by labelling all elements and ecosystems (Van Matre, 1990).
22) Give them the opportunity to share their experiences through drawings, expressive texts or movements (Adams, 1991; Prince, 1984).
23) Encourage them to express their feelings about visited landscapes. Start up discussions on that subject (Adams, 1991).
24) Ask them to make maps of their environment pointing out appreciated and displeasing places (Adams and Ward, 1982; Trimble, 1994).

Results

The above interventions were experimented with 26 students in grade 3. The experimentation was conducted over six mornings during the school year (from October to June). Every morning students were taken on fieldtrips in natural or urban settings. After each fieldtrip, they answered a questionnaire requiring them to draw or write what they had seen, smelled, heard, and touched during the excursion. They also had to write or draw the elements they had appreciated or disliked in the visited milieu. An interview followed and complemented the questionnaire.

The quantitative results of that short term exploratory research suggest that the interventions were able to gradually increase the average number of elements perceived by senses of sight, hearing, and touch in the participants. However, the children's smelling acuteness remained constant perhaps due to the cold weather reducing the smelling capabilities during experimentation 2, 3 and 4 or due to the insufficient number of pedagogical activities aimed at developing this sense.

Other interesting results were recorded. Children did not seem to increase the average number of elements they could appreciate or dislike in their neighbourhood. This research finding confirms the work of Titman (1994) who stated that children can naturally read external environments and respond to places according to their potential (what they might *afford* to them). Our qualitative analysis of the children's answers also concurs with other Titman's results. It was observed the children's ability to perceive details in their environment did not change. Their competence in seeing small things was good at the beginning of the project and did not improve.

Thus, at the end of the project, the children were able to perceive more things in their environment but not necessarily in more detail. However they expressed in their answers a more conscious relationship with their environment. Half of the students expressed a heightened awareness of particular qualities of areas in their neighbourhood. Half of them also spontaneously expressed the desire to improve those places. Finally, at the middle of the experimentation, most of them began to speak regularly about *their own environment* and they often asked for time to experience solos in nature.

This small project opens a new research area in children's relationship with their environment. It should be interesting to accurately investigate children's relationship with their environment before and after experimenting the 24 previously presented strategies.

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GIS Application in Environmental Education

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Context

Florida's vision of education states that " . . . all students should have the appropriate academic background and experiences to give them the opportunity to pursue the career of their choice and the informed decision-making in local, state, and national issues..." (Baird 1993).

The School District of Palm Beach County in South Florida believes that for students to be able to have the opportunity of career choice, they must first acquire the necessary educational tools. One program which has made Palm Beach County Schools a leader nationwide in innovative technological practices is the Geographic Information Systems (GIS) program for 6-12 earth science and environmental science students.

The question... why GIS?... can be answered from various perspectives. First of all, as educators of the 1990's, we know that the competitive work force of tomorrow will build on technological skills which students are acquiring in secondary institutions today. Christene Bennett states that society is being carried forward on a technological tidal wave unprecedented in human history (Bennett 1995). And secondly, environmental issues concerning sustainable development are of major concern to many who are, or who will be, hiring in the present and future work force arena.

School districts across the nation are currently looking at ways to infuse technology into the curriculum and instructional practices. For example, the Roosevelt Independent School District (New Mexico), has developed a technology integration plan for its 23 district schools which focuses on the training of administrators, teachers and students. Many other states are following similar paths.

Faculty and employees from Florida Atlantic University, The School District of Palm Beach County and The South Florida Water Management District realized the need for cutting-edge technology for classroom implementation as early as the late 1980's. Many recognized that one of the leading concerns in years to come would be sustainable development of our community and state. In 1992 and 1993 the three entities collaborated in determining the need for a new and exciting way to move earth and environmental science into the 21st century using innovative technology practices.

Historically in South Florida and other parts of the state and nation, ninth graders choose either earth science OR biology as their science discipline. Unfortunately, statistics show that the advanced learner takes the latter and seldom touches on the essentials of earth or environmental science.

This context lead to the development of a GIS program in 1993. GIS, as part of the earth science or environmental science course, or as a separate program of its own, would not only increase the students' interest in earth and environmental science but also infuse cutting-edge technology into the curriculum. The SFWMD, a government agency, extremely concerned with the future of our youth, offered to train teachers from high schools all over the county in GIS and its applications. They also assisted FAU and the School District with the design and development of a GIS curriculum. The curriculum has since been adopted by the Department of Education in Tallahassee, Florida as "Geoscience". It follows the recommended standards in Benchmarks of Science Literacy, Project 2061, National Science Education Standards.

Definition

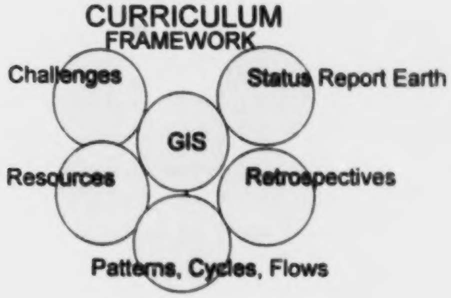
GIS, an exciting and interactive course, encourages students to draw on most skills that are crucial to the development of higher level thinking: spatial and table queries, statistics, logic and compound expressions. Students identify existing data and apply it to solve and analyze human and environmental issues. For example, students have applied GIS to track animal migrations, monitor endangered species habitats, measure local sites via GPS units and monitor and recommend improvement for transportation routes.

Format

The GIS curriculum is a fifty-five-page document, It introduces students and teachers to the advanced application of computers in the analysis of environmental, earth science, economic and human challenges. GIS, an interactive matrix of communicative hardware, incorporates software geographic data donated to selected high school pilot sites by Environmental Systems Research Institute (ESRI) corporation. Such software packages include ArcView that enables students to look at ARC/INFO files with a simple, mouse-driven, point and click interface (Ramirez 1995).

Components

The GIS curriculum document consists of five major themes which reoccur in other science disciplines, such as physics, chemistry, biology, earth science and environmental science.



Each of the five themes describes individual content standards, correlating assessment methods and learner outcomes. The curriculum serves as a catalyst in the coordination of long-range instructional goals in the field of science. For example, students may use process skills in identifying and solving real-life problems, such as examining the environmental ramifications of a hazardous landfill in a community in terms of water supply, soils contamination, weather patterns, etc. The GIS software allows students to analyze the data collected and make recommendations based on this data.

Table 1 GIS Curriculum Format-Component 5: Challenges

Content Standard	Curriculum Framework	CTBSH SCT	Assessment Methods	Competence/Process Skills of Science
5.2. Conducting the research is crucial to validating the hypothesis FSF Strand #1,4 FSF Skills #1-7	hypothesis development outline development management timeline development conducting research	HSCT 1,12, 13, 15, 16 19, 21	Traditional Assessment: Objective test Alternative Assessment: present a project hypothesis for peer review present a display showing statistical data in graph and chart form produce an overlay of coverage using student project data (GPS) Performance Assessment Use a GPS to generate a map that defines geographical research parameters	draw conclusions based on results of independent research analyze research data apply science skills to propose solutions to current problems draft and present a hypothesis

HSCT: High School Competency Test

Impact

The GIS curriculum is a model for systemic reform as it addresses critical needs in environmental and earth science. Based on its successes in challenging students' minds in technology and environmental and earth sciences, the high school curriculum has been expanded to the middle school level. Roosevelt Science/Mathematics/Technology Magnet School (6-8) has opened its doors as the pioneer in implementing the GIS curriculum as a separate technology course to all sixth through eighth graders. The SFWMD and FAU are supporting teachers with inservice training and content workshops. In addition, other institutions around the country, such as Boston University, Kansas City Public Schools, the Ochoco National Forest Environmental Program, Miami-Dade Community College, University of Michigan and more are interested in taking part in the national GIS effort as a vehicle to encourage students to independent problem solving in the environmental science and earth sciences.

Sample portfolios are available at the pilot sites for interested schools.

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Touching the Human Heart: Ours and Theirs

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I hope the majority of us agree with Freeman Tilden[1] when he said that interpretation [communication, environmental education] was not merely information, but information designed to reveal meanings, to provoke thought. He implied in these few words that it was essential for us to understand and use the power of intellectual stimulation to trigger emotion.

Effective environmental education must appeal to feelings, to emotions, to the inner self in which intangibles vital to human completeness reside. This is particularly true if it is to promote personal identification with a sense of place and help people develop a perspective of themselves in relation to their surroundings, society and history.

Today, in North America and many other highly developed countries, a sense of place is either very weak or entirely absent. Where once multiple generations lived under the same roof, extended families now often live in widely separated locations. The result is a lack of identification with lineage, ancestry, birthplace and birthright.

Along with a lack of historical perspective, many people are growing up during a period of the homogenization of society. Almost every place looks like every other place.

In much of Europe, Great Britain, portions of South America, Australia and New Zealand there has, since the mid-1800's, been a progressive movement of population from farms to cities. As this migration has taken place, contact with, and understanding of our relationship with the land and the outdoor environment, has diminished almost to the point of disappearance. Now, large urban centers are made up of people with little or no understanding of cause and effect, of the essential source the their food, building materials, or the raw materials from which originate printed matter and clothing. With this separation have come other more subtle attitudinal and perceptual changes. The things we value and that are relevant to us have changed and as our focus has become centered on the manmade, we have become blinded to natural phenomena.

Jack Borden, whose love of the continually changing spectacle of the sky founded an outdoor education program in the United States called For Spacious Skies[2] after finding that people in Boston, Massachusetts asked to close their eyes and describe spectacular cumulus cloud displays in a crystal blue sky overhead they could not do so. The beauties above them had no bearing on their lives. They had not noticed.

The need for people to "feel" the richness of their cultures and "sense" the beauties of natural resources has never been more important as we find ourselves more able to relegate such things to the trivial. The things we trivialize we devalue and ultimately they are lost.

The sky, particularly the night sky, is a rich resource which tugs at our sense of the infinite and the eternal. During a star talk in the silence of a velvet black night, our minds reach across light years of time and our mind stretches unsuccessfully to comprehend.

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[1] Tilden, Freeman. Interpreting Our Heritage. Univ. of North Carolina Press. 1977.

[2] Borden, Jack. Personal Communication

Historic buildings and districts disappear in clouds of dust as we worship "progress" and modernity rises over the crushed remains of the past. People treasure monetary and material acquisitions and have no comprehension of the value to the human spirit of diversity and the effect of historical perspective or encounters with tranquillity, peace, isolation and aesthetic experiences in the outdoors. For too many of us, history was introduced while we were too young and our perspectives too limited. Whatever else, it was almost without exception begun at a time in the past entirely irrelevant to us. What if our introduction to the past began with our own family history, by looking back from our own birth through father and mother; grandparents and great grandparents? A four generation group sheet accompanied by a pedigree chart and illustrated with small cameo photographs beside each ancestor's name can be a treasure.

Emotion can be used even more imaginatively as the environmental educator develops creative techniques for leading educational walks which traverse the mystical boundary between the present and past.

> At twilight, near a small midwestern town in the United States, a group of lantern carrying people wend their way into a historic cemetery where amid the monuments and the flickering shadows, a creative environmental educator resurrects those who have passed away. Once again, their lives and stories live and for at least a few select people, history becomes the present. In cemeteries, the stories of the past need not be forgotten.
>
> In the darkness of a park in Canada, a uniformed park interpreter (educator?) begins the evening campfire program only to be interrupted by the measured clip clop of a horse approaching. A voice hails the camp and from the past as the ghost of the first Royal Canadian Mounted Police Constable killed in the line of duty materializes from the night, his crimson uniform tunic glowing in the firelight.

Of course, all of these presentations could have been done more simply by traditional educational approaches. And, in some ways, it would have been effective. But, at what level? First person educational experiences are rich in essence but limited in detail. Third person, traditional education is weak on essence and strong on detail. There is a place for both types of education. However, if reaching the heart is the goal, those revitalized spirits from the past will win hands down.

Perhaps nowhere is it easier to transcend the immediate and the physical than in the outdoors. It may be at the top of a mountain, far above timber line as we watch alpenglow gild the surrounding peaks. Or perhaps it happens as, in solitude, we watch the graceful but predatory soaring of a hawk riding ridge born thermals. These are times when words are superfluous, intrusive, unwarranted and un-needed. These are times an educator meets their most intense challenge; that of being quiet, of ceasing to inform in the knowledge that they can do nothing to enhance and much to degrade the experience.

Such experiences can alter our lives, change our perspectives and cause us to reorder our priorities. They can be therapeutic and recreational or re-creational. They can restore our soul and lift us as on eagle wings to peak experiences. Most often, these quiet times are best experienced with a minimum of people.

Open spaces draw our minds and hearts. Our souls extend toward the far horizon. I sat one day at sunset on a lonely point jutting into the Grand Canyon of the Colorado in Arizona. Ravens soared casually past, clowning in their mastery of air and space by folding their wings and tumbling, only to spread them again to soar effortlessly away. Violet-green swallows knifed through the air making impossible right angle turns as they banked like feathered supersonic fighter jets and streaked by my head. A mile below in the depths of precambrian rock, a tiny appearing but mighty Colorado River slid silently by. The sun sank, darkness welled upward and my senses were jolted with a sudden awareness of my minute size. With perfect clarity I understood what an anonymous author felt when they wrote:

> "The silence roared! I staggered back and heard my varnished ego crack!"

It may be gentle like the call of a Hermit Thrush at dusk, stirring as the cry of a loon or the bugling of a bull elk. It may be awe inspiring like the rifle crack of subzero trees exploding against the background booming and rumble of shifting ice floes in the arctic. It may be the prickles along the back of our neck in response to the minor shift in the distant and echoing howl of a wolf. Whatever else, all these things have in common that they are more than solely wildlife biology and meteorological phenomena. They are the heart and soul of the highest and best education in and about the environment. When they are coupled with the full skill and power of communication; the use of powerful words and phrases, dramatic timing, pauses for effect, variations in pitch, rate and volume and appropriate silence, they masterfully enhance emotional experiences and leave indelible lifelong impressions.

Some years ago, a pilot film appeared on United States television. Called "Kung Fu," it documented the adventures of a youth of about 12 entering the Shaulin Temple in China to undergo years of education and training in that marshal art. Over the years he learned to cope with physical and emotional stresses, to avoid evil and to move silently even upon rice paper spread on stone floors.

One day, soundlessly entering the room in which his blind master teacher stood, the old man immediately turned, calling him by name. Shocked, the young man asked, "how is it that you who cannot see can do this thing?" The master responded, "Can you hear your heart beating?" "No," the young apprentice admitted. He could not. "Do you hear the grasshopper at your feet?", the old man queried. Looking down, the awed young man now saw the tiny insect for the first time and of course admitted that he had neither seen nor heard it. "Then," the old man replied, "the question is not how is it that I who cannot see can do these things, but how is it that you who can — cannot?" "In time," he said, "you too will learn these things."

That wise old sage was not talking of heartbeats and insects. He was speaking of a special sensitivity and awareness of and to ourselves and our surroundings. He was talking of perception and comprehension of all things around us and an ability to feel and respond to all those with whom we come in contact.

Environmental educators, exercising their unique blend of information transmission, sensitivity to surroundings and to visitor needs, the ability to tailor activities to specific situations and locations, to use dramatization, and above all, a special sense of the importance of that which they teach, are vital if the world's population is to retain or regain an appreciation of the intangible aspects of life. But, they must be unafraid of purposefully presenting their messages in a manner carefully calculated to reach much more than the human head. By knowledge of self and all that is about them, as well as hearing and responding to the needs of all they meet, they must reach the heart as well. If we fail in this, our job as environmental educators is woefully incomplete.

Teacher Education: Perspectives of Environmental Education

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Introduction

An apparent discrepancy exists between environmental education theory and the environmental education that classroom teachers offer students. The gap causes frustration and confusion and raises concerns about the expected versus the possible and practical role of teachers in providing environmental education in schools. The results of a qualitative research study investigating the beliefs and teaching ideas of three classroom teachers supports this statement.

Environmental education, as advocated by theorists, represents diverse, sometimes overlapping, sometimes conflicting ideas, each supporting a variety of goals of environmental education. However, theories about how environmental education should be approached in schools does not have much to do with the actual practice of environmental education. Teachers do everything from stream studies, recycling and composting to writing letters in the interest of saving wildlife. In the meantime, environmental theorists discuss concepts like ecological interconnections, the influence of cultural beliefs on environmental degradation, environmental ethics and attitudes.

It is evident what the researchers and theorists are thinking. With the limited amount of published research offering insights into the teacher's beliefs about environmental education, it is not possible to assess what the teachers are thinking and how the environmental education theory fits into the actual patterns of school life.

A Study of Three Classroom Teachers

Teachers play a primary role in the nature and direction that their environmental programs take. Teachers' beliefs, and the way these influence their planning and what they say and do in the classroom, should concern theorists who are interested in improving the direction of environmental education research.

This paper is a report of some findings from a qualitative study that investigated the beliefs of three classroom teachers. The study provides some insight into the teachers' views of environment, especially as they contribute to their development and delivery of environmental education programs. Its purpose is to probe how the teachers' beliefs are reflected in their environmental education programs and, most importantly, whether or not these programs reflect the environmental education theory espoused in the literature.

Three main study questions related to environmental education were formulated: 1) What are teachers' beliefs about the environment?, 2) Do the teachers believe their views are represented in their environmental programs?, 3) What factors have the teachers found that contribute to the successful implementation of these beliefs into their programs or, conversely, what factors do they find inhibit their expression of these beliefs?

These questions were explored using interviews and periods of observation, with three teachers who are offering environmental programs in their schools. Over a period of 12 weeks, more than 25 hours of tape-recorded data were gathered using interviews and classroom observations. The interviews consisted of open-ended questions. The three participating teachers are all employed within the same school board. One of the programs is a high school environmental science course. The other two programs are elementary co-curricular environment clubs. The teachers' reflections on their personal experiences and professional practices, as well as opportunities to see their programs in action, provide a glimpse into the relationship between their environmental beliefs and their programs.

A Glimpse of What Is, And Is Not, In The Literature

A review of the literature (Robertson, 1995) suggests environmental theorists have, time and again, asserted their views about environmental education and the way they believe it should be approached. To be fair, some researchers have gathered data from teachers and have even asked teachers' opinions about their needs related to environmental education. The fact remains, however, that teachers have not had opportunities to express their beliefs about environmental education and to provide researchers with a glimpse of environmental education as it is approached in their programs.

Gaping holes in communication, despite the obviously parallel research and education concerns, are evident throughout the literature. Some of the research in environmental education to date has dealt with teachers' knowledge of ecological concepts. There has been research that looks at what teachers know about the environment, specifically ecology (Cherif, 1992). On the other hand, nothing has been published that reports what teachers believe environmental education to be.

A variety of perspectives of environmental education are represented in the literature, demonstrating that the expectations of environmental theorists are diverse and complicated and do not always match the views of teachers. For example, although they have been influential in shaping curriculum development and the research goals of environmental theorists, the recommendations from the Tbilisi Conference (UNESCO, 1980) are idealistic. These recommendations have led to guidelines such as the following:

> Environmental education programs should develop in each individual ethics or a code of behaviour leading him/her to work for the development and utilization of natural resources with the least destruction and pollution, and seek the improvement of the equality of life for everyone by eradicating poverty, hunger, illiteracy, human exploitation and domination. (Young & McElhone, 1986 p. 18)

Many school programs are built around such ideals, first formulated some twenty years ago (Baird, 1991). Yet specific techniques to benefit teachers in the implementation of the socially transformative ways of thinking, suggested by the above statement, remain undocumented.

As environmental degradation continues, some researchers increasingly question the content, purpose and direction of programs meant to educate students about the environment, and whether or not environmental education is developing environmentally responsible citizens (Gigliotti, 1990; Cherif, 1992)

Environmental education includes engendering a clearer and more inclusive perception by students of what environment means. As the literature indicates, this appears difficult to achieve. On the one hand, it may mean teaching students about the intricate ecological interconnections among all species and all environments—environments that provide mutual support and balance to ensure the sustainability and natural evolution of life.

At the same time, though, it may include an examination of the social, cultural, political and economic impacts on these ecological processes. For teachers of environmental education, sorting through these complexities, not to mention the sheer volume of what there is to know, is a monumental task. Although curriculum planners attempt to reduce this to manageable units, the teacher who is well aware of the diversity of concepts and issues will find it difficult to accept one plan. We will examine, then, what role teachers' beliefs may play in environmental education.

A Brief Profile of the Study Teachers

The first teacher, Adam, (all teachers have been given pseudonyms) was interviewed 5 times and observed on 8 occasions. The suburban school in which he teaches offers a variety of creative integrated programs and vocational courses. One of the three courses Adam teaches is a grade 11 general level environmental studies course.

Adam has designed the course himself and notes that he is constantly refining it to meet the needs of the students as well as to accommodate an ever-changing list of ideas he would like to incorporate within its structure. At the time of this study, the course had three main components; daily collection and sorting of recyclable materials and organic waste for composting; an experience component such as landscaping the school yard or taking excursions to local sites such as landfills or nature parks; and a research component to engage students in finding information about environment-related issues and discussing what they had learned with the rest of the class.

The second teacher, Brenda, was interviewed and observed on two occasions. She teaches in a suburban kindergarten to grade eight school of approximately 350 students. As a Curriculum Resource Teacher, Brenda teaches enrichment classes and grade 7 math, and offers curriculum planning support for teachers in the school. She acts as the teacher supervisor for the school's environment club, an activity she volunteered to promote because of her personal interest in the environment.

The club meets formally at irregular intervals, although Brenda tries to encourage the students, and arrange her own schedule, so that there is a meeting every two weeks at noon hour. Club members are responsible for monitoring recycling and composting at the school, primarily by ensuring that containers are available and staff and students are aware of their locations and proper use. The club is also involved in organizing environment-related activities for the school including a letter-writing campaign, promotion of a new environmental video for students, a fund-raising activity to purchase a tree for a school garden and the acquisition of lids for compost collecting buckets from a local company.

Without her own class, Brenda does not currently have the opportunity to teach environmental education but explained some of the environmental programs she had taught during previous years. During much of the interview time, though, she described her past environment-related experiences and present views about environment and the role of environmental education in schools.

The third teacher, Claire, is an administrator at a rural kindergarten to grade 8 school of 450 students. During her four years at this school, Claire has organized an environment club and set up a recycling and composting program. She has promoted these activities at the school (and at a previous school) because of her own concern for the environment.

Claire was interviewed twice and observed at work with the environment club on two separate occasions. During this time, I had the opportunity to see the processes that Claire had put in place to ensure the activities ran smoothly and could function even in her absence. The environment club activities that Claire has implemented were both observed and discussed and are outlined in a handbook which Claire has designed and distributes to each member of the club. The handbook includes details of each job assignment as well as the overall recycling and composting plan for the entire school.

During two 70–80 minute interviews, Claire talked about the procedures and how she has implemented each of these one step at a time. She also told about the workshops and staff training sessions where she has worked with teachers not only to introduce parts of the environmental program but to introduce concepts of global education of which she believes environmental education to be an integrated part. Claire spoke extensively about the powerful role an administrator can play in supporting programs like environmental education. She also talked about her own experiences and how she believes these have contributed to her ideas about environmental education.

What the Data Suggest

The teachers' environmental beliefs, knowledge and skills and their environmental programs provide evidence of the way they view environmental education, including the difficulties they perceive in providing environmental programs. The literature provides other views of environmental education. When these views are examined it becomes evident that disparities in belief about what environmental education is and how it should be provided, create a gap between the teachers and the theorists.

First, the teachers' side of the gap becomes evident by examining the teachers' resources and how these resources assist them with their environmental programs. The teachers' primary resources consist of their beliefs, knowledge and skills, particularly in the way they use these to pull together effective programs. They are involved in environmental education out of their personal concerns for the environment. Their knowledge and skills base comes from their teacher training and experience.

This leads to the components of the gap between the teachers' and the theorists' ideas of environmental education. The teachers are finding that environmental education is a difficult task within the realm of schools for three main reasons: 1) at the practical level, it is not always easy, in terms of variables such as time, materials and schedules, to take students out or to do the things the teachers believe are necessary to support such programs; 2) at the conceptual level, there are so many conflicting ideas and resources that it is hard for teachers to understand what the task of environmental education really is; and 3) at the top level, teachers are not completely certain that they are permitted to do many of the things that are necessary to accomplish the lofty social and political goals of environmental education.

The data demonstrate that these teachers want to take on some of the environmental education theory that has been postulated. However, they meet with difficulty in accomplishing what is a large responsibility. They also experience confusion in sorting out what aspects of environmental education they should attend to. Finally, there is frustration in gaining support for a job that even for them, at times, is not clearly within their jurisdiction.

Five main issues arose that are evident in both the literature and the data. These are: 1) Is environmental education to be presented as an activity or can it be addressed and examined, by teachers and students, as socially and politically controversial issues?; 2) Teachers must juggle variables such as time, scheduling, student interest and ability and administrative support--variables that are not always considered in suggested environmental programs; 3) Researchers continue to debate what environmental education is, including whether or not it should be included as science curriculum and in what form it should be approached, such as an examination of current issues or as action-oriented, long-term community-based projects); 4) Are teachers overwhelmed with resources and under supported in knowledge and methods for approaching initiatives in environmental education? and 5) Teachers' beliefs about environmental education and their perceptions of their mandate, as teachers, focus and limit their programs.

Two Sides of The Gap

Researchers have not discovered common territory with regard to whether or not environmental education includes activities and short term projects, or the study of environmental issues, or if it should move toward a socially critical perspective. The teachers' largely non-controversial programs suggest that the activities and projects route is accessible and acceptable. They are experimenting with issues as a means for introducing a more critical perspective, but in a controlled way.

A gap exists. Teachers want to provide environmental education programs. Environmental theorists want teachers to provide environmental education programs. But the programs and the methods each have in mind are different. These teachers were willing but not as knowledgeable and skilled as the theorists would have it. Theorists have in mind exciting ideas, such as socially critical action projects, but the teachers feel constrained by the apparent number and complexity of tasks to be done and by other competing demands within their profession. And, they feel that they lack a mandate to do what environmental theorists expect in any case.

Environmental education theory, at present, is not sufficiently grounded in teachers' experiences and in what they feel schools can do or what the school day is really like. Environmental theorists like Bowers (1993) are calling for a different view of education. However, teachers and schools continue to work within the current conservative model and such a leap can not be made easily.

Waks (1994) discusses a social charter of schools, wherein teachers are kept on track by cues like standardized tests and expectations based on previous courses, in the context of science teaching. It appears that there are societal influences that keep teachers from treading on delicate ground in the spirit of environmental education. It seems that teachers avoid opening controversial issues because of this invisible but highly evident social charter.

It is the responsibility of environmental theorists to work with teachers to bring such views about teaching environmental education to fruition. We have opportunities to view both theory and the teachers' programs and personal and professional concerns. We need to consider more carefully the teaching practice and its license and limits when examining environmental education in schools and when advocating how environmental education should be taught and what should be taught.

Theorists must attempt to bridge the gap between theory that is taking environmental education into the realm of long-term, politically energized action projects, and the realities of school. In schools, instruction time is limited, and measurable outcomes are in demand. Teachers feel the pressures of accountability for their actions and are often reluctant to risk beyond the safety of an endorsed curriculum.

At the same time, however, environmental educators must find opportunities to bring about real change in currently accepted beliefs and practices. In Ontario *The Common Curriculum* is asking teachers to include environmental education as an integrated part of their teaching (Ontario Ministry of Education, 1993). This is an important window of opportunity for researchers to present the case of environmental education to policy planners and administrators and to suggest direct forms of support. These include teacher education and ongoing professional development that encourages teachers to explore, with students, beyond currently accepted cultural beliefs and practices, especially as these are related to environmental concerns.

I suggest three things, then: 1) we need to bring the environmental theorists in line with the real and immediate concerns of teachers and teaching practice; 2) with the teachers' practices and concerns in mind, we need to sort out the conflicts and ambiguities inherent within environmental education theory and decide what can realistically be accomplished within the context of schools; and 3) we need to work with educators at the curriculum development level and at the policy level to convince them to give the teachers explicit permission to do the things environmental theorists propose.

The information provided by the teachers in this study is representative of their beliefs, experiences and programs. The implications include the responsibility for theorists, in the development and analysis of environmental education initiatives, to consider the effects of teachers' programs, their prior environmental experiences and their current attitudes and actions. Most importantly, it will be in the best interests of environmental education to consider the school context and especially the teachers' beliefs about what is possible and practical within this context, when determining the nature and direction of environmental education.

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Professional Development in EE: Accommodating diversity through distance education

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Introduction

This presentation is based on two research projects focusing on the introduction of national curriculum and national professional development programs in Australia in the last three years. The research projects are:

(i) Contestation between 'national' and community' curriculum development in environmental education, funded by the Australian Research Council (ARC); and

(ii) Environmental Education Across Australia, part of the National Professional Development Program funded by the Commonwealth Department of Employment Education and Training (DEET).

This presentation describes a program developed to support mid-career professional development in environmental education for elementary and secondary teachers, within a context of the introduction of a new national curriculum similar in concept to that introduced in England some three years earlier. The program materials include examples of environmental education from across Australia (from five different states and territories) set in distance education format which allows it to be undertaken anywhere in the country. In describing this program we will address some more general issues associated with professional development and the opportunity that distance education has to alleviate some of the problems posed by the 'tyranny of distance'.

The problematic context for a national curriculum in environmental education

(i) The 'Tyranny of distance'

One of the more obvious difficulties facing attempts at national control over curriculum and professional development in Australia is the sheer size of the continent and its history of state- and territory-based sovereignty over educational provision. Australia is almost as large as mainland USA, divided into eight states and territories but with a somewhat smaller population (1990 estimates show the USA having a population of over 250,000,000 while Australia's population in 1990 was estimated to be over 17,000,000) (Munday 1991). In Australia, educational provision has to contend with the 'tyranny of distance'.

(ii) Local issues-based curriculum

In the state of Victoria at least, there has long been a tradition of grounding environmental education curriculum in the investigation of local environmental issues. Many schools with highly visible environmental education programs have developed curriculum activities around the investigation of such environmental issues as sewerage disposal and its effects on local beaches (e.g. Queenscliff High School), inland salinity (e.g. Elliminyt Primary School), and revegetation of school grounds (e.g. Laverton Park Primary School) (Robottom 1993). In such curriculum activities, teachers and students developed their own 'community knowledge' through their own investigations and report writing, rather than drawing solely on existing text-book knowledge.

(iii) School-based curriculum responsibility

Historically curriculum development in Australia was a state-by-state responsibility. There was no national curriculum, and the responsibility for administering education in the states and territories resided in state governments. Indeed in some states (like Victoria) there was an explicit policy to devolve the responsibility for curriculum development to schools: there has been a very strong history of school-based and teacher-based curriculum development. For states like Victoria, the imposition of central control over education in the form of the new National Curriculum represents a sharp turn in their history from school-based curriculum responsibility towards central control over curriculum and professional development.

The National Curriculum

Australia has developed and is now implementing a national curriculum. The effects of Australia's national curriculum activities are now beginning to be felt. National statements and curriculum profiles have been developed for each of the following 'key learning areas': the Arts, English, Health and Physical Education, Languages other than English, Mathematics, Science, Technology, and Studies of Society and Environment. Although the interdisciplinary nature of environmental education was recognised by the Australian Education Council (a committee of state and Commonwealth ministers of education) in their designation of four of these eight areas as paying particular attention to environmental concerns, the last statement (on Studies of Society and Environment) is the one most identifiably concerned with environmental education. Each national statement sets out an agreed position on the curriculum, defining the area of learning, outlining its essential elements and showing what is distinctive to the area. The national profiles describe the typical progression of learning of students in the area, setting out eight levels of achievement and providing a basis for reporting student attainment.

The National Statement on Studies of Society and Environment is constructed around six key organizers or strands: five conceptual strands and one process strand. The five conceptual strands are time, continuity and change; place and space; culture; resources; and natural and social systems. The process strand is investigation, communication and participation.

In parallel with the introduction of the National Curriculum, schools throughout the country have been required to nominate three 'key learning areas' as their priorities for curriculum development in the first three years of the national curriculum. In Victoria, under the slogan of 'Schools of the Future', schools are developing school charters that set out their curriculum development plans for their three nominated priority areas, and it is these areas that are allocated or attract systemic and institutional resources in the short term at least. And there is recent evidence that in this process of developing school charters, Studies of Society and Environment is not faring well:

> Information collected from analysing the 500 Intake 2 school charters clearly demonstrates that the priority of schools in Victoria is improving the curriculum and the quality of its delivery to students.
>
> In writing their school charter each school has described the core purpose of schooling for its community in the school profile. This core purpose is enacted

> through the establishment of goals accompanied by implementation strategies and achievement measures.
>
> English, maths, health and physical education, and languages other than English (LOTE) will be the major focus for improvement in these schools over the next three years. School resources and staff professional development are targeted through the school priorities to improve the standard and quality of curriculum delivery and student achievement (Brown 1995).

What this comment doesn't state, and what is revealed in an accompanying histogram of priorities classified by key learning area, is that Studies of Society and Environment has received the lowest prioritisation of any of the eight key learning areas. This evidence suggests that the new Schools of the Future process coupled with the introduction of the national curriculum are serving to structurally marginalise Studies of Society and Environment and therefore environmental education, at least in the short term. Given this marginalisation, a corresponding diminution of systemic and institutional resources, teachers with an enduring commitment to environmental education are having to look elsewhere for resources (time, funding, materials...); they usually look to their local community. In our two research projects, we have encountered a number of teachers who have established strong working relationships with community groups and agencies like local business, local government, Landcare groups and youth groups. The irony in this is that the structural marginalisation of Studies of Society and Environment might inadvertently result in environmental education being more aligned with its ethos of collaborative, community-based enquiry than might be the case if it were securely institutionalised through the national curriculum/Schools of the Future process.

The National Professional Development Program

In parallel with its national curriculum, the Commonwealth government has introduced a National Professional Development Program (NPDP). The purpose of the NPDP is to assist teachers in their implementation of the statements and profiles of the national curriculum. Partnerships of universities, professional associations and employing authorities in all states and territories were invited to apply for funding to develop NPDP programs on particular topics with the eight key learning areas. The Australian Association for Environmental Education, in partnership with a number of universities and employing state and territory education systems, received a grant in 1994 to develop six NPDP programs designed to provide access for all teachers across Australia to the philosophies, policies and practices of environmental education and to the potential for incorporating environmental education into the eight key learning areas. One of these six programs, *Environmental Education Across Australia*, was developed at Deakin University; it is this program that forms the subject of this paper.

Environmental Education Across Australia

Essentially, the program looks at relationships between contemporary policies in environmental education and contemporary practices in schools and centres active in environmental education. As we had many years of experience in offering mid-career professional development through distance education at Deakin University, we decided to develop the program 'in distance education mode' to ensure its availability to teachers in remote areas.

In developing this program we wanted to avoid being a complicit agent in supporting uncritically what was (in the national curriculum) a move towards central control over curriculum development. Rather than merely presenting the national curriculum statements and profiles as an unproblematic given, we introduced several relevant contemporary policy developments shaping what goes on in the name of environmental education in Australia today. We attempted to provide an overview of the current policy context nationally and internationally by including commentaries on The United Nations Conference on Environment and Development (UNCED) held at Rio de Janeiro in 1993, Ecologically Sustainable Development (ESD), the National (Australian) Landcare Program, and of course the National Curriculum Statements and Profiles in Studies of Society and Environment.

In terms of representing environmental education practice, we wanted to recognise that EE takes different forms in different places and that teachers in different locations have different opportunities to do environmental education. We also wanted to provide a number of concrete examples of activity ideas in EE for participants to reflect on in light of their own classroom experiences. We did this by developing a series of video-taped case studies of environmental education practices drawn from schools and centres active in environmental education across Australia.

We attempted to develop these case studies through a participatory process. In order to encourage teachers to 'tell their own story' about environmental education in their own professional setting, we invited them to select and sequence about 35 visuals, and to compose a caption for each of these visuals. The visuals, and the caption as a voice-over, were committed to a video-tape. We visited each case study site for about three days for the purposes of interviewing parents, students, teachers and principals, collecting examples of students' work, and gathering school policy statements, prospectuses and the like. We prepared a five page commentary on each school or centre to accompany the video-tape and the textual material we collected.

The nature of the professional development task in this program is for participants to consider the relationships between a range of contemporary environmental and environmental education policies and a range of environmental education practices. Assessment tasks require participants to consider the implications (opportunities and limitations) of these policies and practices for and within their own professional settings.

This program can be undertaken in different ways depending on participants' circumstances. The program can be studied as a distance education package by single teachers or in groups. Alternatively, depending on geographical location, the program developers will be able to visit some sites for an initial four hour workshop (with the balance of the program being undertaken by teachers in distance education mode) or a two day workshop in which most program requirements can be met. The structure and presentation of the program are designed to allow for the diversity of audiences in professional development in environmental education (see Andrew & Robottom 1995).

Conclusion

This professional development program seeks to address the challenge of the 'tyranny of distance' by adopting a distance education approach to professional development in environmental education. Its main professional development activity is a consideration of the relationship between a range of contemporary policy statements and a range of contemporary practices in environmental education, and the implications of these relationships for participants' own professional settings.

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Why Some People Recycle and Others Don't

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Many environmental problems are rooted in maladapted human behaviors. Since the 1960s, numerous authors have asserted that fostering *responsible environmental behavior* (REB) is the main aim of environmental education (e.g. Hungerford and Volk 1990). Therefore, to "save the Earth" we must inspire people to change "irresponsible" environmental behavior into REB. To change behavior, we must better understand and predict it.

The Theory of Reasoned Action

In 1967, Fishbein proposed the theory of reasoned action (TORA) to explain volitional behavior. As Figure 1 illustrates, Ajzen and Fishbein (1980) view intention as the immediate determinant of behavior, and attitude and subjective norm as the immediate determinants of intention. The latter are formed by underlying beliefs about the positive and negative consequences of taking action. TORA was developed in response to a proliferation of research during the 1960s and 1970s on "other variables" to explain the inconsistencies observed between what people say and do. This has been the most influential behavior prediction model, having been studied for almost 30 years (Liska 1984).

The benefits of the model include providing a coherent causal framework defining the relationship between variables, defining variables in operational terms, and providing an orderly way to classify "external" variables which influence only certain behaviors. Environmental education is at the "other variables" stage of REB research as demonstrated by the Hines, Hungerford and Tomera (1986-87) model which synthesizes the literature but is not clearly parsimonious or causal. TORA provides a broader theoretical framework in which to interpret REB research.

Research Method

In this study, TORA was applied to help describe the similarities and differences between households that participate in a curbside recycling program and ones that do not. In particular, the researchers examined one adult in each household's knowledge of how to correctly separate and prepare recyclables, and behavioral and normative beliefs about program participation. The target population was all households in Bexley, Ohio. This descriptive survey was conducted in two one-month phases during the summer of 1992.

In phase one, households were classified by behavior. First, they were stratified geographically according to collection day. A sample of 1000 households was selected for observation using a random starting point on each route. Every weekday for four weeks the presence or absence of a blue bin was noted at each residence. Program participation was defined as placing a bin out at least once.

Subjects were interviewed in phase two. A stratified random procedure was used to subsample 40 participating and 40 nonparticipating households. The typical interview was conducted at the subject's home for about 30 minutes. First, the interviewer measured the subject's knowledge by presenting objects and asking if they are accepted, then asking preparation questions. The score was the total number of correct responses from a possible

29. Second, the person was asked to describe the disadvantages and advantages of program participation, then to self-administer a 22-item behavioral beliefs instrument. Attitude was defined as the mean item score. Third, the subject was asked to name who most affected his or her participation decision, then to respond to a 15-item normative beliefs scale. The subjective norm was defined as the mean item score. It referred to how the subject thought neighbors, best friends and other household members viewed his or her decision and the subject's willingness to comply.

Results

In phase 1, 74% of the households participated in the program. When results were compared to a previous study done by the city, the behavior of a small percentage of households was inconsistent, indicating that they may be partial or infrequent participants.

The response rate in phase 2 was 74%. One vacant house was removed from the frame. The participant rate was higher (88%) than that of nonparticipants (64%). A t-test showed that participants were found to be significantly more knowledgeable about program guidelines (alpha = 0.05). Nevertheless, average scores for both groups were low considering this was a true/false test. Table 1 shows that participants scored consistently higher than nonparticipants. Subjects were most likely to err in thinking unacceptable items were collected, in knowing nothing about rarely discarded materials, or in confusing items resembling familiar recyclables. Nonparticipants often had misconceptions about how recyclables should be prepared. Most people said they learned how to participate through trail-and-error and by observing the contents of neighbors' bins.

Figure 2 summarizes the salient behavioral beliefs. Of the 204 beliefs voiced, 38% concerned nuisance issues, twice as many of which were negative rather than positive. In contrast, 24% of the behavioral beliefs were environmental. Almost all of these were positive as were almost all the satisfaction and all the social beliefs. Economic beliefs were less salient and divided as to advantages and disadvantages. T-tests showed no significant difference in the mean number of positive statements expressed, but nonparticipants expressed significantly more negative ones.

Scores on the behavioral beliefs scale showed that participants held significantly more positive attitudes. Both groups agreed that participation was environmentally and socially beneficial. Regarding nuisance issues, most participants disagreed that preparation was time-consuming or inconvenient, storage was messy, or space hard to find. Nonparticipant responses were bimodal on several nuisance items. Subjects were undecided or held mixed views on program economics. The satisfaction beliefs were not salient ones.

As shown in Figure 3, 58% of participants and 56% of nonparticipants said no one affected their behavioral decision. Others named two influences on average with no significant difference between groups. Note that seven nonparticipants named people who helped them decide to participate. No one mentioned anyone who persuaded them not to recycle. By far, the most common response was to name a family member. Few remembered being told reasons to recycle, most were simply aware of others' opinions or actions.

No significant difference was found between the groups' subjective norms. Numbers were low because some people (especially nonparticipants) lived alone or replied "I don't know" so their scores were excluded. However, item frequencies provided clues to social influences. Participants were more likely to speak to their neighbors about the program and see "all" neighbors put out bins. Answers varied regarding best friends. Almost all participants and a quarter of nonparticipants talked to "all" household members about the program. In most participating households, almost everyone was involved in separation, and half of nonparticipants said "some" household members participated. There was general recognition that program participation receives social approval. Both groups reported an expectation from others to take part but participants perceived it more strongly. Both groups said it was "not at all important" what neighbors or best friends thought of their decision, but about half of participants and a quarter of nonparticipants said the support of other household members was "very important."

Implications for Communicating to Change Behavior

With this clearer understanding of why residents choose to participate or not, several suggestions can be made to encourage REB in Bexley. The first priority should be maintaining the current high levels of participation. This should be reinforced with information showing the effectiveness of residents' actions. For example, town newspaper articles could describe how the program remediates environmental problems and gets people involved in their community. To increase the salience of the social norm favoring participation, the city might try giving awards or other public recognition to high-achieving neighborhoods or use block leaders to encourage participation. People who cannot participate due to physical frailty, however, should not be harassed.

Next, different tactics should be tried to increase residents' knowledge about how to correctly participate. Bin stickers could be distributed showing silhouettes of acceptable materials and briefly describing how to identify and prepare them. The city should also acknowledge that its refuse collectors are their most critical communicators regarding program guidelines and should use bin notes more frequently. Applying TORA, knowledge is probably a background variable that influences residents' nuisance-related behavioral beliefs. Rules need to be kept simple to support beliefs that participation is easy and convenient.

Third, the city should target occasional or partial participants with information designed to decrease perceived costs relative to benefits. For instance, messages should include time- and effort-saving tips, or testimonials on how easy it is to become involved. Alternatively, the city could try to increase perceived benefits relative to costs with messages which make personal satisfaction and social factors more salient. This combination of strategies focusing on participation in this curbside program should help motivate residents who already believe that recycling is beneficial to behave accordingly.

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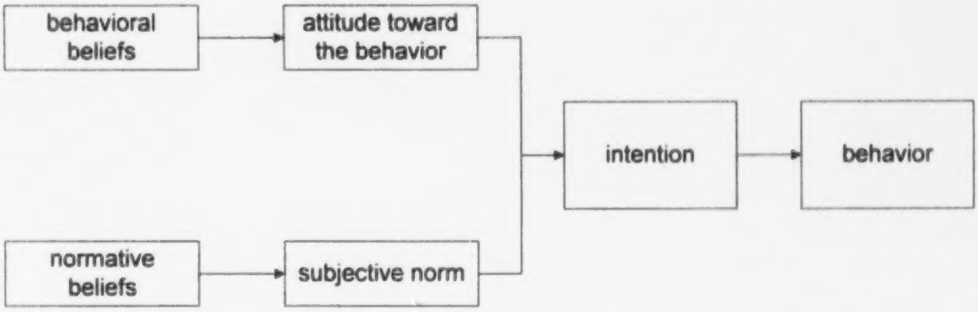
behavioral beliefs
attitude toward the behavior
normative beliefs
subjective norm
intention
behavior

Figure 1 - A model of behavior based on the theory of reasoned action (Ajzen & Fishbein 1980).

Table 1 - The frequency at which participants ($n_1=31$) and Nonparticipants ($n_2=16$) correctly answered knowledge questions

Question	% Correct Response	
	Participants	Nonparticipants
Paper		
1. newspaper	100.0	100.0
2. magazine	58.1	43.8
3. cereal box	67.7	43.8
4. phone book	38.7	37.5
5. computer paper	32.3	25.0
6. have bin present	77.4	75.0
7. keep newspapers dry	61.3	50.0
8. comingle newspapers	90.3	75.0
Metal		
9. foil	67.7	56.2
10. food can	80.6	37.5
11. pop can	100.0	100.0
12. clothes hangar	64.5	56.2
13. coffee can	71.0	37.5
14. comingle pop cans	87.1	62.5
15. drain pop can	80.6	87.5
Glass		
16. blue drinking glass	29.0	31.2
17. clear glass jar	90.3	56.2
18. brown Visionware lid	54.8	43.8
19. green wine bottle	80.6	50.0
20. picture frame glass	42.9	37.5
21. remove label from jar	61.3	43.8
22. rinse jar	77.4	50.0
Plastic		
23. 2L pop bottle	87.1	81.2
24. milk jug	96.8	87.5
25. vegetable oil bottle	22.6	12.5
26. salad bar box	58.1	37.5
27. baby bath bottle	51.6	37.5
28. remove jug cap	74.2	43.8
29. crush jug	48.4	43.8

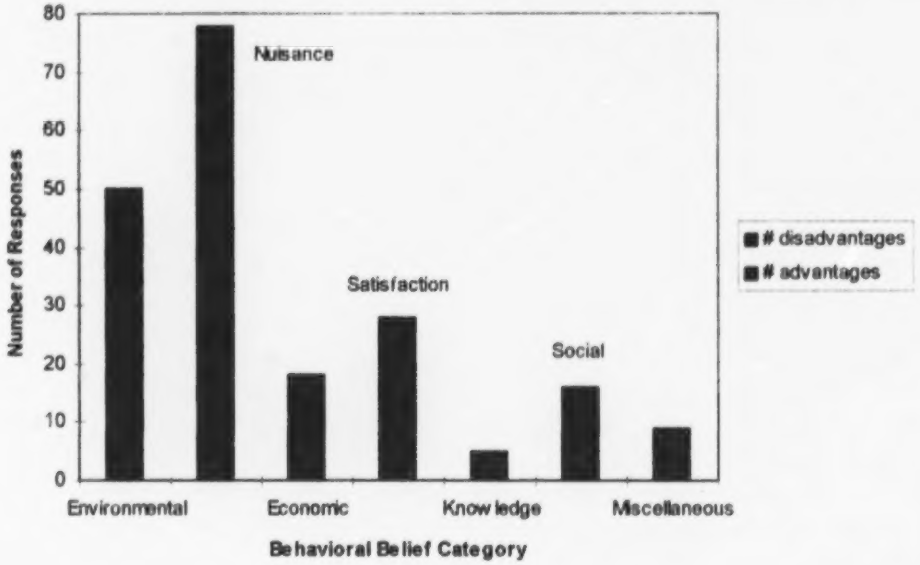

Figure 2 - The number of positive and negative behavioral beliefs mentioned according to category (n=47; $n_{responses}$ = 204).

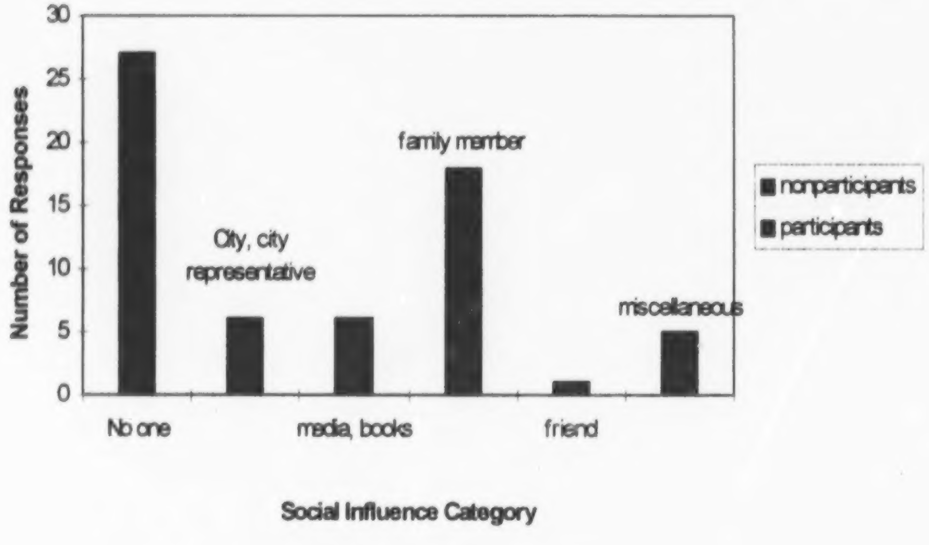

Figure 3 - The number of social influences according to category mentioned by participants (n_1=31) and nonparticipants (n_2=16).

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Environmental Management Education in an International Context

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Introduction

The study that provides the basis for a consideration of Environmental Management Education in an international context was recently completed by Hsu (1994) in Taiwan. While almost unbelievable economic accomplishments have been achieved over the past three decades in Taiwan, the gains have been paralleled by an increasing population and an accompanying rapid economic growth of the country that has produced severe environmental problems, a reduced environmental quality and a related deteriorating quality of life in Taiwan (Environmental Protection Administration [EPA], 1988). Hsu further points out that the government and the public have become increasingly aware of and sensitive to the wide variety of environmental problems and have initiated many efforts in environmental protection and natural resource conservation to address such problems. One of these efforts has been program development in environmental education (EPA, 1988, 1992).

A common approach to any planning process utilized by environmental educators has usually been to confront such basic questions as: "What content should be included in environmental education programs?", and "What do the public and students know?" Rocchio and Lee (1974) suggested that the first step in a planning process for environmental education should be to conduct an assessment of the existing situation in a particular area. This approach coincides with Towler and Swan's (1972, p.245) statement that: "As a first step toward creating an environmental education program we must know what base we can build upon, and the status of students'[or citizen] knowledge and attitudes about the environment." Environmental knowledge and attitude assessment of a target population can Environmental educators in determining what content should be included in programs. Such an assessment, along with appropriate scientific data, can also provide a detailed picture of how effective the existing programs have been in educating the public.

There are already many studies regarding environmental education in the United States, however, such studies are few in Taiwan and most other countries. As stated at the 1980 Paris Conference (United Nations Educational, Scientific, and Cultural Organization [UNESCO], 1980): "There is no universal model for the incorporation of environmental education into the environmental [management] process. The approaches, procedures, and progressive stages of integration must be laid down in light of the specific conditions, ultimate aims, and the educational and socio-economic structures of each country" (p.35). Stated simply, mindless imitation of the environmental education development of the United States is not what is required. Rather, environmental educators of a given country should carefully examine and learn from successes and failures in environmental education development elsewhere, and frame their own educational goals and procedures on the basis of thoughtful consideration of the economic, cultural, political, and resource conditions unique to there respective countries.

A review of the literature reveals that in the past two and one half decades most environmental education studies selected students as their target population, while only a few studies involved community leaders and decision makers as their target populations. In the

Tbilisi Conference (UNESCO, 1977) it was suggested that "Environmental education should be provided for all ages, at all levels and in both formal and informal education..., and should constitute a comprehensive lifelong education and must look outward to the community" (p.2). Dierking and Falk (1985) specified that an effective environmental education program, in order to impact society, should educate the *whole community*, (emphasis mine) not just school children. Since many changes in the life of a community require fundamental changes in knowledge, attitudes, and behaviors of the residents, community leaders are recognized as actively influencing the actions, opinions, or directions of the residents (Trecker and Trecker, 1979). Therefore, at the local level, it is especially important for environmental educators to assess and promote environmental knowledge and attitudes held by community leaders.

An Example Study

The Hualien area, located in the eastern part of Taiwan, has a population of approximately 200,000 (EPA, 1992), and because of public awareness of and concern for environmental issues during the past decade, the government has taken several actions in relation to felt needs. The government leadership has established Taroko National Park, an environmental education center at Hualien Normal College, and a Natural Resources Institute at National Tunghua University. The public in the Hualien area has organized several community environmental organizations as well. It can be suggested that environmental education as presently available in the Hualien area provides the people of Hualien with opportunities to acquire the knowledge, values, attitudes, and skills needed to improve their environment. However, there are no studies about the impact of such environmental education in the Hualien area. A study was designed to examine the environmental knowledge and attitudes held by selected community leaders in the Hualien area as a means of providing environmental educators an essential data base upon which environmental education programs could be built. Further, this study proved to be useful in establishing baseline data from which further studies about environmental education in the Hualien area and Taiwan could proceed.

Objectives of the Study

Seven objectives were utilized in the conduct of the study by Hsu (1994) as follows:

1. To assess environmental knowledge and attitudes held by selected community leaders in the Hualien area of Taiwan.
2. To identify any significant relationships between environmental knowledge, attitudes, and the independent variables (gender, age, educational level, occupation, income level, ethnicity, area of residence, length of residence, visitation to national parks, and frequency of visits to natural areas).
3. To identify any significant relationships between environmental knowledge and attitudes.
4. To determine the most serious local and national environmental problems, and the major source of environmental knowledge as perceived by the selected community leaders.
5. To identify any significant relationships between environmental knowledge, attitudes, and community leaders' perceptions of major sources of environmental knowledge.

6. To identify any significant relationships between community leaders' perceptions of the most serious environmental problems and the independent variables.
7. To determine which types of environmental education activities the selected community leaders would be willing to attend.

Methods

Instrumentation

The assessment instrument developed for Hsu's study focused on those environmental concepts related to the earth's life-supportive capacity and the long-term well-being of humans, and on those environmental facts and concepts related to the environment of Taiwan. As a result of the literature review in both the United States and Taiwan, especially focusing on the studies by Roth (1970), Townsend (1982), and Chou (1991), the following environmental categories were chosen to be included in this study: Population, Ecology, Pollution, Natural Resources, and Social/Economic/Political Influences.

Instrument development was based on previous studies with similar purposes . The items selected from the previous studies were related to general environmental concepts and were deemed suitable for use in Taiwan. The other items were developed according to special environmental situations in Taiwan and the instrument was based on studies conducted by Perkes (1973), Richmond(1976), Bohl (1976), Villasmil (1985), and Perez (1987). Each environmental knowledge or attitudinal item fit into one of the five environmental categories stated above.

The construction projects of The New Central Cross Island Highway across Yushan National Park, The Fourth Nuclear Power Plant, and a large-scale cement industry appear to be three important issues for the residents in eastern Taiwan. The three construction projects could cause enormous environmental impact in eastern Taiwan; therefore, the decision to move forward with these projects is still in the decision making process and is a basis for environmental disputes in the Hualien area (The Steering Committee, 1989; Hualien County Council, 1993). The instrument included three opinion items about these three issues.

Structuring for Population Sampling

According to the community structure of the Hualien area, ten different categories of Leaders were identified as follows: Civil Service, Political, Educational, Religious, Industrial/Business/Mining, Professional, Communication, Agricultural, Community Organization, and Minority Group.

As a result of a literature review (Walton, 1966; Preston, 1969), it was decided that a combination of the positional and reputational methods would be used. The positional method was used to identify the leaders who were in positions of authority in the ten different main sectors of the Hualien area. The reputational method was employed to ask those community leaders identified from the positional method to identify additional persons whom they considered to be community leaders. This was done to include those leaders who might operate "behind the scenes."

As a result of employing a combination of the positional and reputational methods, 725 community leaders were identified. It can be reported that there were 176 selected community leaders who returned the questionnaires from among the 250 initially sampled. The response rate was 70.4%. Respondents to the first three mailings (early respondents;

n=158) were compared with respondents to the fourth mailing (late respondents; n=18) to check for non-response bias utilizing t-test (Miller and Smith 1983). No significant differences in responses to environmental knowledge and attitude scales were identified between the early and later respondents. In addition, the respondents seemed to appropriately represent the stratified sample of the target population. Therefore, the data were considered to be representative of the sample.

A follow-up qualitative inquiry was conducted to interview 12 selected community leaders to further validate data interpretation.

Results

The overall level of environmental knowledge was determined to be moderately high and the attitudes appeared to be positive. A positive correlation coefficient of 0.42 was found between community leaders' environmental knowledge and attitudes. Significant differences in knowledge scores by age, educational level, income level, ethnicity, and in attitude scores by age, educational level, occupation, and ethnicity were found. The results of stepwise multiple regression indicated that educational level was the best predictor of environmental knowledge and attitudes. At both national and local levels "environmental pollution and the destruction of ecosystems" was perceived to be the most serious social problem by the largest number of community leaders.

Next Steps

1. Follow-up studies of the target country would be of use in identifying changes in general environmental knowledge and attitudes of the general population thereby providing a data base upon which to better assess the effectiveness of existing environmental education programs.
2. A similar, easily reproduced instrument for assessing knowledge and attitudes should be developed and standardized for use throughout the country being studied. Such an instrument could provide the data upon which comparisons can be made.
3. Further studies could attempt to better explain the significant differences in environmental knowledge and attitudes with respect to age, educational level, occupation, income level, and ethnicity. For example as Hsu and Roth (1995) reported: "...why the elected political representatives and mass communicators scored significantly lower on the environmental attitude scale?) (p.26).
4. The stepwise multiple regression models indicated that most of the variance in environmental knowledge and attitudes could not be explained by the independent variable included in the study. Further studies might be of use in identifying other independent variables which could explain more variance in environmental knowledge and attitudes.
5. Studies such as that reported need to be conducted in all regions of a given country to expand generalizability of the findings and accuracy of interpretation.

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Five Years of EE Law: A Changing Political Climate

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When the 1990 Arizona Environmental Education (EE) Act was passed, most Arizonans associated EE with protecting environmental health and recreation areas. By 1995, EE was associated with excess government regulation. In Arizona, the attack on government regulation had two prongs that resulted in eliminating the EE mandate. One prong was an attack on laws and regulations that required environmental stewardship, while the other was an attack on state school requirements.

The Political Climate

During the early 1990s, a number of issues associated environmental concern with laws and regulations that had adverse impacts on jobs and economic development. The concerns that appeared in pronouncements by public officials and letters-to-the-editor emphasized the theme that environmental regulation was too costly (and those costs were concrete and current) for the alleged benefits (which were often abstract and long-term). For example, the use of the Endangered Species Act to halt various types of projects was very visible in the media. On Mt. Graham, the issue pitted scientists and university administrators against environmentalists. In another case, logging on public lands was delayed by the endangered status of the Mexican spotted owl. Other cases pitted environmentalists and/or federal agencies against ranchers. In all of these cases the public perception (at least as shown in the media) emerged that environmental issues were trivial when compared to jobs and livelihood issues.

Meanwhile, several politicians in the state positioned themselves as states-rights champions and opponents of federal regulations, especially environmental/land use regulations. The governor asserted state rights in going to court against federal rulings. The governor was also prominent in Washington, DC testifying before Congress on the negative affect of environmental legislation. As the governor was positioning himself on the national scene as anti-big-government, there were legislators following his lead, asserting that obtrusive state legislation should be eliminated.

The schools of the state, feeling overburdened with a host of curriculum regulations (AIDs education, substance abuse education, environmental education) and irritated by a change in state assessment, were ready and willing to support a bill to repeal state curricular requirements.

These two prongs of attack on environmental education were represented by two different bills that were introduced into the 1995 Arizona legislature. Senate Bill (SB) 1348 was introduced as the Title 15 (Education law) Clean-up Act and was intended to eliminate a variety of state curricular mandates (including a required free enterprise course). Meanwhile in the House the attack on environmental education was more direct in the form of House Bill (HB) 2274 which eliminated the EE mandate and added requirements to EE if it was taught. These requirements were that the most scientific information be used and costs/benefit information be provided for each environmental concept taught. Although this bill was amended by the original sponsor and others, it remained fairly intact in its final version. Of some interest is the fact that SB1348 was heard by the education committee of the senate with little opposition from the environmental education community, while HB2274 was opposed by many EE advocates including state environmental groups (but not the state EE organization).

It is important to recognize that the 1995 Arizona legislature was different from previous legislatures in that there had been a shift not in parties (a Republican majority is usually the rule in recent Arizona politics) but within the Republican representation. In both the House and the Senate, there were enough conservative Republicans to constitute a majority and thus ignore the moderate Republicans who, in the past, had always played a key part in legislation. This was most apparent in the almost universal assignments of committee chairs who belonged to the conservative wing of the GOP. Thus, when the bills emerged from the conference committees, during the final days of the legislative session, the bills were being re-written by the conservative members of the legislature. Further evidence for the conservative and anti-environment nature of the legislature is found in other bills passed during the session. The most striking bill to emerge from the legislature was one permitting the manufacture of CFCs in the state of Arizona. The vehemence of some members of the legislature against environmental regulation can be seen in bills that died in committee including one that placed a bounty on the Mexican gray wolf if it were introduced into the state. It should also be noted that the legislature had dealt a minor blow to the EE act the previous year resulting in the embargoing of the EE Guidelines by the department of education.

Given the political climate and the political players in the state, it was not surprising that the two bills were passed and signed into law. In part, the strategy of eliminating EE along with other curriculum requirements sealed the fate of the mandate. Although the efforts of environmental educators were rewarded in some instances (successful amendments on the House floor and on the Senate floor); in the long run the efforts were too diffuse and failed.

Current Status

The requirement that school districts have an EE plan is no longer law but experience suggests that few teachers or even district personnel know that is true. There is a fairly large lag time between the establishment of laws/regulations and their enactment in the educational community. (Some teachers are just learning about the 1990 EE Act.) Very few teachers in workshops that I have conducted recently know about the additional restrictions placed on EE by HB 2274 (i.e. the use of the most current scientific principles, inclusion of economic costs and social impacts). Among those who understand the new law, few are aware of the fact that the EE requirements for the state universities was left untouched by the 1995 legislation.

What has been the result of the end of the mandate? The most immediate result has been confusion. During the past summer, the annual Arizona EE Academy was canceled due to lack of enrollment; at Northern Arizona University (NAU), EE classes were under-enrolled and several were canceled; outdoor education classes at Arizona State University had lower than normal enrollments. It appears that the media and the legislature were successful in creating confusion about EE.

Of greater concern is the loss of assistance to those schools who desire to continue EE. The Arizona Department of Education has "washed it hands" of EE and no longer provides EE assistance to schools. The EE guidelines are no longer available from the department.

Funding for environmental education is confusing. The state education department distributed EE funds (from a special EE license plate) on a per capita basis to schools (creating an interesting situation since schools no longer have to teach EE). The future of the funds is unclear as the legislation shifts the moneys to the Land Department (in October 1996) but allows the Arizona Advisory Council on Environmental Education to recommend disbursement.

Despite this, EE is alive and fairly healthy in Arizona. Compared to 1990, more teachers are teaching better EE. Teachers are developing new environmental science and studies courses in middle and high schools. At NAU we have a number of EE projects training and providing assistance to teachers in K-12 schools. One of the projects includes the development of a CD-ROM for providing EE inservice; the project uses the now "banned" Arizona EE Guidelines. Furthermore, teachers are asking their principals about the EE money from the state. Contrary to the perception of the legislature, the people of Arizona continue to support environmental legislation. Two surveys released this past summer show that about two-thirds of Arizonans would pay more to improve the environment. In one poll, 69 percent agreed with the statement that, "We must protect the environment, even if it means that some jobs in the local community are lost."

Lessons Learned

Perhaps the key lesson learned is to know more about the legislative process. Too often, we who were involved in the process were surprised at how fast (and how slowly) different aspects of legislation occur. A second lesson was to have a "quick response network." We seldom were able to mobilize very many people as the legislation quickly became a moving mosaic. A third lesson was to enlist the aid of key legislators and lobbyists. We might have been more effective if we had dealt directly with sympathetic legislators and provided them with potential compromise positions. Finally, as trite as it may seem, we are looking for lemonade coming from the lemons. We continue to work with the AACEE on funding issues and hope for a better future.

Theories and Practices of Primary School Teachers in EVE in Québec

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Abstract

This article presents the preliminary research problematic, questions and objectives as well as the outlines of the problematic and conceptual and theoretical framework of a multimodal research focusing on the theories and practices regarding EVE of primary school teachers practicing EE.

Research problematic

According to the official discourse (UNESCO 1978, 1987; CIERE 1994; MEQ 1980), environmental education (EE) should be a part of the primary school curriculum. In Québec though, the importance of EE in school does not really show, for a minority of teachers actually practice EE (Robitaille and Sauvé, 1990). And among them, only a few integrate EVE which is a key aspect of EE. With this observation in mind and in order to better understand the problematic of EVE integration in EE, to clarify professional formation needs and to catch a glimpse of continuing education needs in that domain, I want to clarify how teachers who already practice EE conceive EVE and what characterizes their practice in that domain.

Research questions

What are the theories and practices regarding EVE of primary school teachers who already practice EE?

Are there gaps (narrowness, biases, incoherencies) in these theories and practices of EVE?

On the contrary, can these theories and practices constitute a source of inspiration for the development of more adequate theories and practices of EVE?

What does a critical analysis of these theories and practices bring to us in view of a continuing education program in EVE for primary school teachers?

Research objectives

General objectives are to, in cooperation with teachers,

- clarify theories and practices of teachers in primary school regarding EVE;
- analyze these theories and practices using a critical approach;
- identify some avenues of continuing education in EVE.

Operational objectives:

- elaborate by anasynthesis a global conceptual and theoretical framework of EVE;
- make a descriptive and interpretative study of EVE theories of seven teachers who already integrate EE to their educational action;
- make a descriptive and interpretative study of EVE practices of seven teachers who already integrate EE to their educational action;
- with a critical approach, identify both high points (richness, relevance, coherence) and weaknesses (limits, biases, inconsistencies) of teachers' theories and practices;
- with a critical approach, revise if necessary, the theoretical framework initially elaborated to the light of theories and practices of teachers in EVE;
- identify continuing education needs for EVE primary school teachers;

- identify the broad outline (content and process) of a teacher's formation program in EVE.

Problematic

In the early 70's a polemics began between researchers and teachers about the transmission of values at school. In 1979, Québec's Education Ministry recognized the place of values in the school in an interventionistic perspective and stated certain values related to environmental education. During the same period, EE claimed a growing place in the official discourse on the international (Unesco-PNUE, 1978) as well more local levels (MEQ, 1979). More recently, (Rodger 1993) and(Caduto 1985, 1986) presented the development of environmental values as the master key of EE end recognized the importance of EVE. Moreover, along with a growing number of authors, the Superior Council of Education (SCE 1990) presents the development of ethical competencies (contained in the values education domain) as one important stake of contemporary education, EE being the other. And among ethical competencies, the SCE recognizes the place of environmental values. However, recent studies (Robitaille & Sauvé 1990; Bédard 1992) show a lack of integration of EE in Québec schools. So what happens with EVE?

By establishing a global conceptual and theoretical framework of EVE and its problematic, I will allure a reflexion to show the importance of EVE, particularly in the schools of Québec.

Conceptual and theoretical framework

Before presenting some concepts that I have analyzed, I want to emphasize that my primary goal in this research is to conduct a descriptive exploration of the following concepts: Education, Values Education, Environmental Education (EE), Environmental Values Education (EVE), Values, Environmental Values and Environment. My preliminary research has shown a great diversity of conceptions about these concepts. I plan to eventually devise an organizational design that will best show this diversity and enable me to justify my position in regard to definitions of key concepts in my research. Here are some of these concepts I have looked into. Please note they could not be presented in detail in this article.

Environmental Education

Sauvé (1992) observes that the different definitions of EE proposed by authors as well as UNESCO (1977), rarely clarify the notion of environment and, moreover, that "they overlook an important finality of education concerning the person-environment relation that is the optimal development of individuals and the community within their living environment" (p.73). According to Sauvé (1992), EE's definition should include not only its goals towards the quality of the environment, but also the quality of life of individuals and communities in addition to the quality of action of these individuals and communities towards the environment. She proposes a definition of EE that, in my opinion, fills in the previously exposed gaps:

> Environmental education is an integrated dimension of the development of individuals and social groups that concerns their relation to the environment. Environment is considered here as a systemic set of the living environment's biophysical aspects, in relation with sociocultural elements and that interact with living species of that milieu. This permanent process has for key objective to develop in individuals and communities the knowledge that facilitates the

> optimalization of their relation with their living environment as well as a knowledge and a will to act that brings them to act individually and collectively, in short and long terms, towards the preservation, restoration or improvement of the quality of their common heritage necessary for life and quality of life.

I adhere to this definition because, contrary to the one Unesco-PNUE 1977) and Unesco-PNUE proposes, it includes the integrated dimension of development, it defines the referent "environment" and is more explicit concerning the objective of the permanent process.

Environmental Values Education

Since EVE is still developing and that there has not yet been devised a comprehensive global theory about EVE that would be both specific to EVE "and include its many possible aspects, perspectives and orientations" (Sauvé, 1992, p.66), I will have to elaborate such a theory. For now, I shall only expose some pertinent theoretical elements. EVE is included in the general objectives category of EE that relate to the development of attitudes and values favorable to the relation with environment. Sauvé (1992) in Legendre (1993) defines this notion as follows:

> Education that aims to develop competencies relative to the analysis of the values implicated in environmental issues but mainly to develop attitudes and clarify one's own values in regard to the individual-community-environment network of relations (p.467).

Environmental Values

In the literature specific to EE and EVE, values that are as environmental are in no way defined by the authors I have read. More and more, it appears to me that so-called environmental values are the product of a social construction accepted in the official discourse as well as by certain researchers in EE and EVE and some workers in the EE field. Many authors often make reference to some ideal values, either instrumental or terminal, of the American society when they talk about values in relation to environment.

Overview of Methodology

I would like to carry out what could be called a multimodal research. First of all, it is a collaborative research because, for a large part of it, I will ask primary school teachers to be precious colleagues instead of simple research objects. I plan the following scenario that includes two parts: one theoretical, the other descriptive and critical.

The theoretical part (Gagné and Lazure 1990) of my research aims the elaboration of a conceptual and theoretical framework of EVE which is still at an embryonic stage in the literature (Caduto 1985). This conceptual and theoretical framework could be modified and/or enriched in light of the data collected concerning theories and practices of the contributing teachers in the second part —descriptive, interpretative and critical—of my research. This framework will also enrich the critical dimension of my research. Although there undeniably exists some pertinent information in the literature to date, I believe this framework will improve with the progression of my research.

The second part of my research comprises both a descriptive and interpretative aspect (Legendre 1993; Rousseau 1990) and a critical aspect. I plan to carry out seven case analysis implicating seven primary school teachers in order to delimit their theories and practices in

EVE. To achieve that, I will use phenomenological research methods (Deschamps 1992; Selltiz 1977) like in-depth interviews (Legendre 1993; Hitchcock and Hughes 1989) and "participant observation" (Deschamps 1992; Dufour and coll. 1991). The teachers will also be asked to experiment, in class, a pedagogical model for values clarification. It is my hypothesis that putting them in a situation of experimenting a model can help them clarify their theories and pedagogical practices in EVE.

For the second half of the second part of my research, I would like to use group discussions (Legendre 1993) as an additional methodological tool so that the participating teachers, in a critical process (Carr and Kemmis 1986) of reflexive experiment, can contribute to their own formation in regard to the clarification of their theories and practices in EVE. These group discussions will also help identify teachers' needs in that domain and leads for continuing education of primary school teachers.

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Environmental Education Research

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This research-action was an experience held in the classroom with the purpose of promoting harmonious and required consciousness for the good use of resources of Nature, and also evaluating the pedagogic process being carried out. We describe the development of two experience of environmental education in primary and secondary schools called Centro Integrado de Educaçao Publica (CIEP) and Ginasio Publico (GP) in Niteroi and Ilha de Guaratiba, of Rio de Janeiro State, Brazil. This research is the result of two final papers of the Science Education Course of Universidade Federal Fluminense. The methodology used was based in the constructivism of Piaget and in some papers of Lev Vygotsky.

Methodology and Results

The research carried out in a primary school in Niteroi had the following methodological moments: At the beginning of the class the teacher asked the student to invent and drew a trip to an unknown Planet. In one of the drawings we saw a simulated trip where the child linked the men and science. After that they observed, took notes, and collected material of the Planet to build a collective planet Earth/Water (Terrario–Ecosystem in a bottle). They discussed every day what had happened in the terrario— water cycle, organic material decomposition, synthetic material preservation, devastation caused by ecological disequilibrium, germination and animal metamorphosis. They made relationships between the Macro (Universe and Earth) and Micro (Planet simulation–Terrario). We analysed what was going on in Terrario and what the textbooks showed (some with conceptual mistakes). We had activities such as games and stories (A Historia de Pinguinho, an interesting instrument with animism metaphor). They built conclusive texts and drawings and we discussed and made the following texts: "The health and the environment ", "Natural material for the maintenance of the Planet Earth/Water", "Vegetables and fruits as important food to health", "Medicinal Plants", "Organic waste, recycling and vegetable garden".

The research carried out at the 7th grade in Ilha de Guaratiba in two classes with thirty students each. Man and environment is a topic of the curriculum of science in this school so we developed a program with different activities to show the importance of the environment. We tried to use the local ecosystem as an example. The program had the following methodological moments. The students completed some questions about men and prehistoric era.

The analysis of the answers showed that they have an idea of how the life in the past was hard and that men had to fight to be alive. In some books we see the idea of harmony between men and nature in the prehistoric era. After that they saw a documentary "Origin of Man" from National Geographic. We discussed it, linking biology and history in class. They collected information about environmental disequilibrium in the region and in the world and they chose one topic (e.g. water, health, sea, forest). A lot of groups talked about forest devastation. They presented their posters to the group and we discussed the main topics. Then we gave them some environmental problems and they had to present a solution. It was interesting to know the power of the neighborhood association in their speech. We read a text about problems that affect the planet such as acid rain, pesticides, erosion, etc. We discussed and they drew two situations, a clean and a dirty environment. At the end of the unit they completed another questionnaire and the evaluation was continuous, during all the classes.

Conclusion

This research-action showed us that the connection between education, health and environmental education context is essential for the comprehension of pollution and forest conservation. Environmental education in the basic level teaching has proved to be an efficient innovation to build an environmental consciousness. The dialogue between teacher and students was important and they were proud of their findings in the debates and in working with the Terrario. The culture and systematic knowledge strengthened the self-confidence of the students making them happy and world lovers. The continued evaluation together with critical discussion, the chemistry, history, biology, and language help the construction of basic knowledge in primary and secondary classes.

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Role of Zoos as Conservation Centers

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Evolution of Zoos

Zoos have been changing dramatically over the past few decades. From their start as menageries displaying a diversity of species, they have evolved to become zoological parks that feature animals in their habitats. At Brookfield Zoo, we believe the next step is for zoos to become conservation centers for their communities (Rabb, 1994). This means a greater focus on ecosystems and a more holistic view of conservation that includes people.

A zoo can support conservation in different ways. For example, it can be a *model citizen* by trying to be internally consistent and ensuring that its operations are as environmentally friendly as possible. It can also serve as a *community resource and motivate*, educating, inspiring, and enabling people to take informed actions on behalf of the environment. The role of *wildlife, habitat, and ecosystem conservationist* is one with a focus on the wise management of small populations of animals. Finally, a zoo can be a *mentor and trainer*, sharing its expertise and training others to work for conservation.

I will focus on the second role—how zoos can inspire their publics to live more sustainable lifestyles. In addition to the valuable work that zoos are doing regarding animals, the essence of a conservation center is "putting people into the picture." Perhaps our greatest impact will be in how we communicate with our public about conservation. But how do we do that effectively?

The traditional approach to teaching about the environment is to focus on the knowledge or messages we want to share. The belief is that if we provide people with information, this will lead to a change in attitudes, which will eventually translate into a change in behavior (Ramsey and Rickson, 1977).

Knowledge → Attitude→Behavior

Brookfield Zoo has decided to take a more proactive approach and place greater emphasis on the behavior outcomes of its programs. By focusing on behavior change as an objective, we can then work backwards to decide what information to include and what attitudes to target in order to accomplish these objectives. Achieving behavior change is not easy. The relationships between knowledge, attitude, and behavior are, unfortunately, not as simple as the above causal, linear association might suggest (e.g., see Hines, et al. 1986-87; Ajzen and Fishbein 1977). However, theories about human nature and evaluation techniques can help shape and refine the design of programs focusing on behavior change.

Incorporating Change through Evaluation

Evaluation is an important part of overall strategic planning at Brookfield Zoo. We are trying to think more about the entire visitor experience so that we can be relentlessly consistent with our conservation messages. Our overall vision is to help society achieve a more sustainable relationship with nature. Just as our biological research informs animal management decisions, we also have a department called Communications Research, which I direct, that helps with audience issues.

Essentially the department provides a feedback loop from the audiences to the people creating the program content. The methods we use include surveys, interviews, observations, and focus groups. We collect fundamental demographic information about our visitors (e.g. education, income, age, race). We also collect psychographic information, which involves lifestyle dimensions such as attitudes, interests, and personality traits. Both types of data were collected during a recent joint study by Brookfield Zoo and Lincoln Park Zoo; we looked at the conservation knowledge, attitudes, and behaviors of people in the Chicagoland area to create audience profiles of zoo visitors and non-visitors (Chicago Zoological Society and Lincoln Park Zoological Society 1993).

Once people get to Brookfield Zoo, Communications Research staff monitor how satisfied visitors are with the services the zoo is providing. Zoo managers realize that we must address fundamental needs—such as eateries and restrooms, a sense of security, and a need to socialize—before we can expect visitors to be receptive to conservation messages.

A major avenue for reaching visitors with our messages is through our exhibits. At Brookfield Zoo, we have a system of exhibit design teams, composed of staff from throughout the zoo, and coordinated by three people. All exhibit development is based on a communications strategic plan that is geared not only towards giving information to the public, but also towards trying to influence behavior as much as possible through our exhibits and programs. As exhibit components are developed, they are tested with visitors with these goals in mind.

Tropic World - A Behavior Change Exhibit

Tropic World: A Primate's Journey is one exhibit that has been modified to better support Brookfield Zoo's commitment to conservation. When Tropic World originally opened in the early 1980's, it provided a model for many rain forest exhibits throughout the country. It was the world's largest indoor zoo building, as well as an early example of the immersion approach where visitors are surrounded by mixed species and realistic experiences. However, it was not reaching its full educational potential.

Thinking about our goals as a conservation center, I worked with a team to develop an interpretive plan. Rather than just focus on conservation of rain forests, we chose to highlight the primates in the exhibit and talk about the relationship between primates and their environment. Since 90% of all primates live in tropical forests, Tropic World's rain forest setting was perfect. Because humans are primates, it gave us a way to talk about humans and their environment and bring the message home.

Thanks to a generous grant from the National Science Foundation, we were able to implement our plan. The central idea behind the new Tropic World is that primates make *choices* and those choices have consequences. This behavioral flexibility of primates is an important part of their lives. Within the exhibit, visitors learn about the choices primates make about food, communication, and social behavior. Comparisons with the choices that humans make are interspersed throughout the experience. A major goal of A *Primate's Journey* is to encourage visitors to make wiser environmental choices.

Before we started on Tropic World, we had to test some baseline knowledge and assumptions underlying the exhibit. There are different stages of evaluating exhibit interpretation: front-end happens in the beginning, formative along the way, and summative evaluation at the end. We began with some front-end evaluation about people's knowledge and attitudes about primates by surveying 150 visitors. When asked to identify the primates in a list, only 58% knew or admitted that humans are primates. Lemurs were even less recognized as primates.

We also conducted three focus groups with representatives of different age and ethnic groups. One of the things we checked was how people would react to the concept that "humans are primates". The reaction was usually one of surprise. Only a few accepted this statement matter of factly. The focus groups helped us find the right language for addressing this concept in the exhibit.

Blending Theory and Application

We took this kind of front-end evaluation and coupled it with what we know from the literature about encouraging conservation behaviors. This literature is actually quite scattered and comes from a variety of disciplines, such as psychology, advertising, political persuasion, mass communication, environmental education, and social marketing.

The last section of Tropic World will be an outdoor adventure game that deals with human choices. Called the "Quest to Save the Earth", it is filled with challenges that encourages visitor groups to work cooperatively. Conservation behavior approaches were used to design the challenges, and techniques such as experiential learning, cooperative games, docents as models, storytelling, and humor were applied throughout. The desired outcomes of the Quest are that (a) visitors will leave knowing they are making choices in their lives and that those choices have an impact, and (b) visitors will leave with a greater likelihood of doing a new conservation behavior.

As visitors play the Quest, one of the challenges will be to cross the Bog of Habits. This involves choosing stepping stones to get across an imaginary bog. The stones represent different behaviors or choices that can impact the environment. For example, recycling, driving a car, taking a vacation. One member of each group plays the role of guide or facilitator, providing information to the individuals crossing the Bog. As members who are crossing the Bog select different conservation behaviors, the guide reads about the environmental impact of the selected choice.

We used the concept of a "preferred environment" as our framework for shaping the design of the Bog of Habits. A preferred environment is one that would create a sense of competence in a visitor and has the following features: one is able to "make sense" of it, it offers novelty, challenge and uncertainty, and it is permitting of choice (Kaplan and Kaplan 1982; Kaplan 1973).

Formative evaluation was essential for refining this creation of a preferred environment. Feedback from zoo visitors helped us develop the conceptual layers of the game and the physical layout of the stepping stones. We wanted people to go beyond thinking of "right" *vs.* "wrong" choices, feel good about conservation behaviors they are already doing, explore behavior choices and their impact, and consider adopting a new behavior or changing an existing behavior.

Results from the summer of 1994 are encouraging: 60% of visitors (N = 90) said they both learned something new and were likely to try a new behavior. An additional 9% said they would probably change their behavior even though they were familiar with all the choices

(Irvine, et al. 1995). We continued to evaluate the Bog this past summer, increasing the sample size and exploring measures of behavioral intent.

There are many other aspects of the Quest experience. Another challenge is called the Tower of Balance, where visitors work in groups to select large geometric blocks representing modern luxury items. The shapes indicate degree of impact those items have on the environment and the idea is to balance the blocks to reach a goal. We developed the conceptual aspects of this challenge through formative evaluation this past summer.

Final Thoughts

Of course, to address behavior change outcomes more fully, research suggests that other pieces are necessary - - such as more concrete action steps (De Young 1988-89), success stories (Monroe and Kaplan 1988; Bardwell 1991), and a place to make a commitment (Katzev and Wang 1993). These aspects are being added throughout the Quest experience. Once the Quest is completed, we will do more extensive testing to see whether we are achieving our objectives.

I chose Tropic World as an example to show how we are approaching exhibit interpretation with behavioral outcomes in mind. I also indicated how Brookfield Zoo is trying to have all its communication programs support each other in a strategic way.

Behavior change is not a clear cut entity to study because there are so many different factors that affect whether someone will actually do a behavior or not. However, principles about human nature and dynamic evaluation tools can help guide us. If zoos and other conservation organizations can be vehicles for inspiring the public to adopt more earth-friendly behaviors, we'll go a long way towards creating a society that can live more sustainably with nature.

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Language, Culture, and EE: What's the Connection?

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Reaching a Multi-Cultural Audience

No matter which culture students come from, if their out of school experiences have not exposed them to academic ways of talking, they face a similar challenge at school: learning the language of the academic culture. This is especially the case for middle school students. In middle school, students confront a new way of using language as they begin to study particular disciplines. Students are expected to begin reading and writing an "academic" style of language that poses many problems for students unfamiliar with it.

Why is language so important? Learning "concepts" is very much connected with learning the language used to express those concepts. This means knowing the vocabulary of a discipline and knowing how to read and write the types of explanations that characterize the discipline. Environmental education draws on content areas, including science and social studies, which themselves have special characteristics in terms of the literacy skills they require of students. In my current research on the language used in environmental education in urban middle schools, I have identified three specific ways that language poses problems for student comprehension: through its technical terminology, through the level of abstraction used in presenting concepts, and through the lack of identifiable agents in environmental texts.

Language in Environmental Education

This paper will show some ways that language is used in discussions about the environment and will provide some advice about how teachers can help students to understand and use language to learn about environmental issues. I'll be using the topic of biodiversity for my examples.

What is it that's hard about learning about biodiversity? The basic concepts are not difficult: that there is ecosystem diversity, species diversity, genetic diversity. That biodiversity is threatened by habitat loss, introduced species, pollution, population, and overconsumption. The ideas are not difficult, but the language is.

Technical terms

Academic discourse creates technical terms to distill information into expressions that stand for long explanations. This is a normal part of every discipline, but teachers need to understand the challenges it poses. What is needed for students to understand terms like ecosystem diversity, species diversity, genetic diversity? Or to understand that biodiversity is threatened by habitat loss, introduced species, pollution, population, and overconsumption?

Take a term like "introduced species." Knowing the meaning of the individual words does not really help students understand what it means. Instead, a student has to gain a new understanding of the word "introduced:" that animals or plants are brought from one part of the world to another, where they compete with plants and animals that already live there (native species), and often cause changes in the ecosystem. This is a complex explanation for which the term "introduced species" is shorthand. Once a student has learned the explanation, the term "introduced species" is a handy shortcut which summarizes it. But until the full explanation is clear, any discussion about "introduced species" is unlikely to be fully understood.

It's not just a question of knowing what the words mean. Students also need to understand the range of ideas and values that are typically understood by those who use a technical term.

Abstraction

Once these terms are familiar to students, they also need to comprehend and produce the kinds of explanations that are typically found in texts about the environment. Academic language typically expresses concepts in very abstract ways, quite different from how spoken language typically expresses the same concepts. The abstraction is a result of taking processes or happenings and representing them as things; making them appear less real and more abstract.

For example, take a sentence like:

> *Many of the world's cultures have developed sustainable ways of living that protect natural resources while still meeting human needs.*

A more spoken version would be:

> *In many parts of the world, people have learned how to grow food and use land, air, and water in ways that keep the environment the same year after year, and they still have everything they need for a good life.*

Note how much more concrete this is, and how much less scientific. Translating "sustainable ways of living" into everyday language means describing what it means in real terms by giving concrete examples. Written academic language typically generalizes from this concrete explanation, making the concept appear quite abstract.

Abstractions are difficult for both teachers and students because often they are somewhat ambiguous in stating what is really meant. It is left up to the teacher to translate these academic explanations into everyday language, providing illustrations and examples in order to help students understand. And in giving examples and illustrations, often a new meaning is conveyed, because the abstract language of academic subjects allows us to generalize meanings. People can agree with an abstraction who would have a lot of trouble agreeing on how to make the abstraction concrete.

Terms like "the destruction of the rain forest," "degradation of the environment," and "loss of biodiversity" condense and distill explanations about actors and actions, making them into things that can be evaluated or talked about as entities in themselves. This makes the process or happening behind the thing quite abstract.

I'm not saying that we shouldn't use abstract terms. This is the way language helps us to generalize away from specific cases and explain the world. But students need practice in "unpacking" these statements to explore the complex processes that are behind each of the abstract terms. Activities that give students practice expressing the key concepts of environmental education in everyday language can help students to understand these concepts better. Activities that help them learn to express these concepts abstractly then give them practice in talking the language of EE in more academic terms. And they need to be able to do both.

It's not bad English or even too academic to use terms this way. This is just the reality of language use in technical fields such as those that environmental education draws on. But this is a use of language which is different from ordinary conversational language, and students need help and practice in understanding and then producing language that condenses information in this way.

Agency

This takes me to my final point about how the language of EE poses new challenges to students who are struggling to learn within the academic culture. It's not just that environmental problems are represented in English as static things that are very abstract. Even when we express environmental problems as processes or happenings, the way English grammar allows us to represent these concepts can reinforce the impression that these environmental problems occur because no one is paying attention, or because people don't know about them. The fact that they occur because their occurrence serves some economic or political interests is not revealed in the way they are typically represented in environmental texts. For example:

> *In many countries, forests are disappearing, water supplies are drying up, rich topsoil is eroding, and growing human populations are putting too much pressure* on the environment.

Representing the issues this way obscures the fact that in each instance, it is particular actors in particular situations that we are talking about. This problem for students has to do with the expression of *Agency*; that is, identifying the "actor" in explanations about the environment. Where is the agent in discussions about environmental problems? How are the agents identified in environmental discussions? Typically we read that "the oceans are polluted by oil spills;" "the rainforests are being cut down." But where is the agent of the oil spill? Where is the actor in the cutting down of the rainforest?

And the grammar of English allows us to construct sentences in which there is no agent at all. For example:

> *When shopping malls are built, habitat is altered or destroyed.*

Who is doing it? And this is not just a problem of passive vs. active sentences, as some prescriptions for clear writing might have us believe. We can turn this into an active sentence by adding an agent:

> *When people build shopping malls, they alter or destroy habitat.*

But even this obscures the real agents. Is it the carpenters who build the malls who are responsible? How are students to identify the decision-makers who are behind the destruction? Just a generalized "people" does not really explain what is going on in each of these environmental issues.

One student put this in particular focus when, in answer to a question about what is harming biodiversity, he wrote "People are cutting down the rainforests." But then he added "Who are these people, anyway, and how can we stop them?"

What Teachers Can Do

The language of environmental education poses challenges for students who want to understand the concepts expressed through this academic discourse. What can teachers do to help students not only to comprehend what is meant, but also to learn to use this style of language so they can fully participate in discussions and decision making?

Start with the technical terms. Examine them to see what underlying concepts and knowledge students need to really understand them. Then take the explanations that summarize main points. Look at how, in generalizing, they may present concepts so abstractly that students have difficulty understanding what is really meant. And think about agency.

How is the language preventing students from identifying who is responsible for the actions that are represented in the explanations about the environment?

Through careful exploration of the meaning of technical terms, through "unpacking" sentences that express very abstractly some notions that need to be made concrete, and by exploring agency in environmental issues, we can help students to use language in the new ways that schools require, and give students from all cultural backgrounds more opportunities to be actors in addressing the environmental problems in their communities.

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Appendix – Providing language support in EE: What teachers can do

Vocabulary

- Preview topics and new vocabulary when presenting new material. Pictures and other visuals are important aids for understanding.
- Provide vocabulary games or worksheets so students can practice working with key terms and check their understanding.
- Focus attention on technical terms, defining them in language that is familiar. But do more than *define* terms. Be sure students are aware of the issues relevant to full understanding of the term. Terms that are complex nouns will need to be broken down into parts and further elaborated for students. For example, "Introduced Species" implies a whole story about species which are brought from one place to another, an understanding which involves more than the ordinary understanding of the word "introduce."
- Pay attention to terms that may be unfamiliar to students because they occur more often in writing than speaking. Words used to compare or make causal connections, such as *produces, leads to, causes*, and *results in*, and abstract vocabulary, such as *principle, example, property, explain*, and *generalize*, are important for academic literacy.
- Pay attention to "cultural" vocabulary which might be unfamiliar to students from some backgrounds. Names of foods, current trends, and many familiar expressions ("sweet tooth," "green thumb") are in this category.
- Help students see connections between nouns and verbs, or nouns and adjectives. For example: consume –> consumption   extinct –> extinction

- Have students use new terms often. Encourage them to use technical terms when they ask questions or contribute to a discussion, and in writing.

Concepts

- Use structured organizers, outlines, summaries, charts, graphs, symbols and diagrams, demonstrations, and concrete objects to show visually the relationship among terms, processes, or steps.
- Ask questions often, and rephrase the questions and answers of students to summarize what has been learned.
- Help students to "unpack" the meaning of sentences with abstract terms by restating them, using more concrete language.
- Have students say things in more than one way, using both scientific and ordinary language.
- Teach students to use abstract language, combining terms in complex sentences that describe, compare, or discuss objects or events.

Skills and Activities

- Use oral language and cooperative group activities to help students process difficult information before tackling individual assignments. Have them organize and plan their answers to difficult questions in small groups, where they can practice asking each other for summaries and explanations or formulating questions for one another.
- Read aloud to students and allow them to read aloud to each other (not necessarily in front of the whole class). This can help students make associations between spoken and written forms of language.
- Provide reading strategy advice for tackling difficult reading passages. This could include focusing students' attention on headings, providing preview questions, or highlighting key points.
- Assign writing following oral discussion. Teach students formats for writing about environmental issues, including descriptions, comparisons, definitions, and reports. Provide guidelines to help them structure what they write.
- Have students identify the causes of environmental problems. Have them investigate environmental issues and explore the decision-making processes in their own communities.
- Have students investigate and discuss policy issues related to environmental topics to give them practice using scientific language and reasoning to make value choices and to analyze what is in their interest.

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Multidisciplinary Environmental Science

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The Problem

Many students are exposed to a rather traditional course of studies which requires a minimum number of credits in science, math, social studies and language arts. Frequently these courses have nothing to do with each other and any carry over from course to course happens only by chance. New standards for education being developed by national mathematics, science, social science and language arts groups emphasize the interrelationship of all fields. The goal of this course is to treat education as one multidisciplinary whole, using understandings and skills from all major disciplines to prepare students for the complicated life of the decade following the year 2000.

Major Resources for Development of Course

The ideas expressed here are largely taken from two outstanding programs of study that have been developed over the past years. Anyone interested in developing a course similar to this should be aware of the following resources.

1. "Activities for the Changing Earth System", Earth Systems Education Program, The Ohio State University, 29 W. Woodruff Ave., Columbus, OH 43210. The Ohio State University Research Foundation, 1993. This is a great set of activities that provides materials and ideas for teaching about global environmental changes. This program has been developed through the efforts of excellent public school teachers and qualified research scientists.
2. "ECOLANDS, Responsible Environmental Decision Making" by Dr. Shirley L. Griffin, 1992. This is a fantastic set of tried and tested materials that introduce teachers to ecological, economic and political information about local communities and watersheds. This guidebook provides a "framework" that enables teachers and students to explore their local environment. For further information about this program, please contact Dr. Griffin at Oakmont Regional High School, Ashburnham, MA 01430.

Course Structure

The course is developed around a few major "Themes" dealing with concepts from the fields of biological science, earth science, physical science, mathematics and social science. In addition, skills from the areas of art, language arts and computer science are utilized.

Major Themes: (modified from Earth Systems Education Program)

1. The earth is vulnerable and its resources are limited. Continued growth of the earth's population accelerates the depletion of natural resources and possible destruction of the environment.
2. Biologists, chemists, earth and space scientists, physicists, mathematicians and social scientists use a wide variety of methods in their study of earth system. Scientists create, test and modify models and theories that represent, explain and predict changes I the earth systems. Scientific study may lead to technological advances, but, technology alone cannot be expected to solve all of our problems. The use of

technology may have benefits, but careless use of technology often has unintended side effects.

3. The interacting subsystems of the earth system are water, rock, ice, air and living things. these systems are constantly changing and go through natural cycles. Forces, motions and energy transformations drive the interactions within and between the subsystems. Biologists and earth scientists with the help of mathematicians, physicists and chemists are working hard to accurately describe and calculate these forces, motions and energy transformations.
4. The earth is very old and constantly evolving. Cycles and natural processes take place over time intervals ranging from fractions of seconds to billions of years. Materials making up the earth have been recycled many times, energy is not recycled and we depend upon the sun for our major source of energy for the earth. The earth is just a small subsystem of our solar system which is just a "dot" in the vast and ancient universe. Astronomers and mathematicians are able to accurately describe and predict the motions of the earth with respect to the sun, moon and other objects. These motions determine seasons, climates and other things such as tidal changes, etc. The rotation of the earth is responsible for a predictable phenomena called day and night.
5. There are many careers in the sciences that deal with environmental problems. Many "laymen" are also involved with environmental problems and decision making. Teachers, scientists and technicians who study the earth are employed by business, industries, government agencies, public and private institutions and also wok as independent contractors. Scientists from all over the world cooperate and collaborate by using oral, written and electronic means of communication. It just may be true that if we don't learn how to communicate our understandings to each other, and if we don't figure out creative ways to deal with new problems as they arise, nothing else may be very important.

Pedagogical Design

The basis for instruction in this course lies in the research that has been conducted by Mr. Ron McGuire and Dr. D. Schmidt over the past five years. These findings have been reported as, (1) "Understanding the Learner", 1993; (2) "Understanding Learner Anxiety", 1994; and (3) "The Relationship of Science Anxiety to Learning Style", 1995. In simple terms, it has been discovered that each student in a class has a unique set of experiences and aptitudes. These "learner skills" must be identified and utilized by the teacher in a positive way. Each student brings with him a unique "learning style", it turns out to be very important to allow students to use their "style" at least part of the time during a course. If a teacher does not take into account "learner skills and learning style" it can be shown that anxiety levels remain high during a course.

Early in the course each student takes the Myers-Briggs Learning Style Assessment. With this information the teacher is able to provide activities and experiences that match individual interests and learning style. It turns out that some students do very well with assignments that emphasize social science skills, activities such as oral history of a development site or discovering the structure of local and state governmental agencies that deal with environmental issues. A few students are skilled in mathematics/quantitative thinking, they become the "number crunchers" for the class, using spreadsheets and computer statistics packages to represent such things as land usage for commercial and residential purposes in a graphical fashion for class discussions. The physical science is introduced during laboratory activities involving environmental testing of soil, air and water. The biological science and earth science concepts illustrated by a functioning ecosystem are used to address and offer solutions to most of the environmental problems encounters throughout the course.

Thus, by making use of the strengths of the individual students, the course become multidisciplinary. Teams of 3 or 4 students investigate such topics as land acquisition for an urban renewal project, environmental problems associated with the development of a new golf course, road salt and local well water salinity, development of land for residential use and the related wetland considerations for all of the above.

Special Instructional Strategy

1. Team learning groups. Three or four students grouped together because of their diverse interests and skills. Groups study problems and report findings to entire class.

2. The use of internet and other electronic media along with conventional resources to develop a data base for each problems studied.

3. Unique Style of Team Teaching. Due to time and financial considerations, it is impossible to place two or more teachers in a single classroom. It is possible however to develop a team of teachers from various subject areas, a team that will be responsible for a multidisciplinary course. The team is made up of teachers from social science, math, earth science, biology, chemistry, English and computer science. Weekly team meetings explore the possible ideas and avenues of approach for the course. However, the actual course instruction is always done by the same individual teacher. Frequently special instructional sessions are held to bring the class teacher, who is to deliver the instruction, up to date on a particular skill or technique or idea . Thus the scheduling problems, the financial problems are avoided and students adjust to only one class teacher during the course.

4. Simulations. Computer programs such as "SimLife" and "SimEarth" (by Maxis) and "Water Pollution" (by Educational Materials & Equipment Co.) are utilized. Board games such as "The Pollution Game" (Ed. Res. Council) and "Population" and "Ecology" (Water Systems Co.) are utilized for the introduction of new terms and also as a change of pace during the course.

Evaluation

During our studies of anxiety in science classes we have discovered that evaluation is an important factor in reducing anxiety. Continued "formative evaluation" throughout the course is very important to make the students feel that they are part of the course. We ask the students orally and by writing to evaluate the progress of the course and to make suggestions for change and modifications.

We have also discovered that students really don't care how difficult a course is, they really don't care if they get the top grades, they just want the evaluation of their performance to be honest and fair. The simple rule is, the teacher should indicate clearly what is valued and then the teacher should assess what is valued. Many forms of summative evaluation are used, giving individual students a better chance for success. The following is a partial list of evaluation methods used for this course: Drawings, Concept Mapping, A Learning Journal, Creative Writing including Poetry, Problem Analysis, Practical Laboratory Tests, Games and

Simulations, Technology Based Assessment, Traditional Paper and Pencil tests, and Student Projects including student designed and produced videos.

It is possible to develop and deliver a truly multidisciplinary science course efficiently and without great expense. Environmental Science is an excellent subject for the development of such a course.

Urban Children's Perceptions of Nature

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Introduction[1]

A major aim of environmental education is to encourage children, and especially urban children, to experience and appreciate the wonders of nature. Through schools, camps, nature centers, and a variety of youth organizations, environmental educators provide programs that introduce urban children to natural systems. Most of these programs are built on the conviction that positive youthful experiences in natural settings will contribute to a lifelong commitment to maintaining a quality environment (Tanner, 1980)[2]. The chances of meeting this goal are greatly enhanced by well designed learning experiences that take place in natural environments. Structuring these experiences appropriately for urban children is one of the challenges of environmental education.

But in order to provide a positive nature experience that will encourage a depth of feeling toward the environment, it seems only reasonable to assume that one needs to first understand how urban children perceive nature and what determines whether they would be comfortable spending time in nature.

Research Methods

Third and fourth grade (8-9 years old) students from four cities in the urban Chicago metropolitan area participated in the study (Table 1). Two schools from each of the four urban areas were recruited. From each school, two classrooms were selected based on teacher willingness. All data was collected during the regular school day.

Utilizing a set of black and white photographs, urban children's perceptions of various natural settings were examined. The focus of the study was on students' preferences and perceived comfort levels with the natural environment.

Data were collected in two parts. First, the children (n=316) were asked to rate, on a one to five scale, the set of 30 black and white photographs for preference (i.e. how much do you like or dislike this place) and comfort level (i.e. how comfortable would you feel spending time in a place like this).

Next, 3–4 randomly selected students from each classroom (n=58) were interviewed in depth, allowing a more comprehensive examination of their views and providing the opportunity for follow up questions. Seven groupings of photographs or prototypical settings (Simmons 1993) were used in the interviews with the students: Rivers, Ponds, and Marshes; Deep Woods; Interpretive Paths; County Park; Open-Fields; Urban Nature; and School Site Setting. For each set of photographs, the child was asked a series of questions: 1) What is it that you particularly like or dislike about this place? 2) If someone said that you were going to visit this place, what would you think? 3) If you were going to visit this place, what types of things would you like to do? 4) Can you think of anything that would worry you or bother you about visiting this place? and 5) Have you ever visited a place like this before? Interviews lasted approximately 30–45 minutes.

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[1] This research was funded, in part, by the U.S. Forest Service, North Central Experiment Station, Chicago, Illinois.

[2] It is recognized that to accomplish fully environmental education's goals a much more complex set of relationships must be considered. See Hungerford and Volk (1990) for a detailed discussion.

Results

School Site Setting

The most highly preferred grouping of photographs was all taken at various elementary and high schools, but not labeled as such for the children. Interestingly, even though they were not identified as schools, many of the students referred to them as school sites during the interview. The School Site setting photographs were given significant higher preference (mean = 4.4) and comfort level ratings (mean = 4.3) than any other setting with the exception of Urban Nature (Table 2).

Urban Nature

The photographs for this grouping, taken in downtown Chicago, all show some nature (e.g. trees, lawn, shrubs, Lake Michigan) juxtaposed with the cityscape. As the preference (mean = 4.4) and comfort level (mean = 4.3) ratings indicate there are considerable positive attributes associated with the Urban Nature setting (Table 2).

Open-Fields

The Open-Fields grouping includes pictures of grassy areas with varying sized trees evident. For the most part, the trees are in the background with the mowed grass being the dominant feature. It is interesting to note that the photographs were taken at a variety of sites including a big city park, an arboretum, a state park, and a school yard. The Open-Fields setting (mean preference = 4.2; mean comfort level = 4.2) was also greeted positively (Table 2).

County Park

The County Park setting consists of photographs that depict a rather manicured, developed park or forest preserve with mowed grass, big trees, picnic shelters, picnic tables, a water pump and parking lot (mean preference = 4.2; mean comfort level = 4.2) (Table 2).

Interpretive Paths

The Interpretive Paths group, with a preference rating of 4.1 and a comfort level rating of 4.1 (Table 2), includes scenes of well defined paths with trail markers and interpretive kiosks.

Rivers, Ponds, and Marshes

Water environments traditionally invoke highly positive reactions from research participants (see Kaplan and Kaplan, 1989). However, although the children gave the water scenes, Rivers, Ponds, and Marshes, a preference rating of 4.1, the comfort level rating (mean 3.9) was significant lower than any of the others with the exception of Deep Woods (Table 2). It is interesting to note that the photographs in this grouping represented a wide variety of water settings. One photograph showed an urban river, another a recreational lake with a dock and rowboats, while still another was of a turtle in a marsh. The common element for all of the photographs was water.

Deep Woods

The photographs in this grouping depict scenes of heavily wooded, deciduous forests; a pine stand; and a prairie scene with woods in the background. There are no obvious indications of human impact; no structures, trail signs, or parking lots are visible. Deep Woods was found to be significantly less preferred than the other groupings (mean = 3.8); likewise, the children were significantly less comfortable with this setting (mean = 3.6) than any of the other settings (Table 2).

Discussion and Conclusions

The results suggest that children perceive distinct differences in nature settings. The School Site and Urban Nature photographic groups elicited the highest preference and comfort level ratings, and were, by far, the settings which most exemplified the built environment. Rivers, Ponds, and Marshes and Deep Woods, which illustrated "wild" nature, were given the lowest preference and comfort level ratings.

As a result of the interviews, the children's descriptions of likes and dislikes provided insight into what attributes of these sites are most preferred. The children do like and are fascinated by nature. Trees, various animals, open space, and the presence of water seem to be particularly enjoyed. However, the children expressed a great deal of fear and concern directly related to the nature depicted in the scenes.

Worries seem to center on three broad categories: potential natural hazards, people, and inconveniences. A concern for potential natural hazards focused on the various real and imagined animals that they might meet in the setting. This was particularly true for those settings that showed the greatest amount of wildness. Likewise, the students expressed considerable concern over threats from other people. In particular, they seemed to be worried that they might be kidnapped.

Finally, it is important to understand how a particular nature area is perceived and in return be wary of how one presents that nature area to children. It is clear that settings do project specific impressions. It is also clear that children associate varying hazards with particular settings. How the teacher/environmental educator introduces the site to the children may well determine what, if any, environmental education goals will be met during a visit. The onus is on the teacher/environmental educator to provide the necessary imagery. Otherwise, children will rely upon their own misperceptions, dreading an upcoming environmental education experience rather than seeing it as an exciting opportunity.

Table 1

Participant Background

Gender:	
Male	55.2%
Female	44.8
Ethnicity:	
African American	17.8%
Hispanic	53.5
White	28.7

Table 2

Setting Preference and Comfort Ratings

	Preference Mean	Comfort Level Mean
School Site	4.4	4.3
Urban Nature	4.4	4.3
Open-Fields	4.2	4.2
County Park	4.2	4.2
Interpretive Paths	4.1	4.1
Rivers, Ponds & Marshes	4.1	3.9
Deep Woods	3.8	3.6

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An Australian Landcare Approach to Environmental Education

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Landcare in Australia - Setting the Context

Australia is unique for many reasons, with the native animals and plants adapted to suit the ancient, often fragile soils and climatic extremes. Before British settlement in 1788, the aboriginal inhabitants had used and managed the land for over fifty thousand years. When the British arrived, settlement patterns evolved on the assumption that there was plenty of land. However, only 10% of Australia is arable and thus suited to long-term settlement. The attitudes and behaviour of the settlers towards the land were exploitative and practices such as over-clearing, over-grazing and the introduction of exotic plant species and hard-hoofed animals led to many land degradation problems.

Land degradation is now recognised as Australia's most serious environmental problem. By the late 1970s, over half the land used for agriculture and grazing in Australia was in need of repair (DEHCD 1978). Australians are among the most urbanised people in the world. Most (85%) live around the continental coastal margins, and are either unaware of, or do not understand the seriousness of the land degradation problems affecting Australia. For attitudes and practices to change on a large scale there was a need for the Australian community as a whole to understand the need for sustainable land management.

In 1989, a national land management program for Australia was proposed by the peak organisations representing conservationists and farmers. This led to the declaration of the 1990s as the Decade of Landcare and a $A320 million commitment by government to fund a range of programs including education (Commonwealth Government 1991).

The resulting National Landcare Program (NLP) is a government-funded program with strong community support. It was developed to combat land degradation, achieve sustainable land use by the year 2000 and instil a Landcare ethic in Australians during the current Decade of Landcare. A tall order perhaps, but since its inception, a quarter of Australia's landholders have joined community Landcare groups. There are currently 2,200 groups around the country, mainly rural, but many have an urban or coastal focus. One of the NLP's major strands has been support for education as a means of reaching the wider Australian community, particularly the future generation of land managers.

An Education Response

During my Ph.D. research I came across an innovative education program based at the University of Wisconsin-River Falls (Meyers, et al. 1987). The main aim of the program was to instil in Wisconsin classroom teachers a basic understanding of the importance of soil and water conservation, giving them the confidence to teach conservation. The background was that Wisconsin law makes conservation education obligatory in teacher training programs (Lane, et al. 1994) unlike Australia, where environmental education is taught in only a few teacher training institutions with very little opportunity for professional development for practicing teachers. The Wisconsin program seemed like an effective way of reaching K-12 teachers and providing them with a basic understanding of the need for sustainable land use practices in Australia. One aspect which I found attractive was the focus on accessibility for teachers without a science background.

Recognising the potential value of the program if adapted for Australian teachers and environmental conditions, I successfully applied for funding from the National Landcare Program. After corresponding with the course lecturer, I subsequently visited Wisconsin to attend the summer school program in July, 1990. On returning to Australia, the first Landcare for Teachers course was held in August. Since then, the Landcare for Teachers course has broadened out to include the widest aspects of Landcare.

Landcare Education

Environmental education is included in only a few teacher training programs in Australia. Landcare education provides a framework introducing an environmental education element into teacher-training programs where none had existed previously. It also provides teachers with a means of introducing environmental education principles into the curriculum of schools in conservative rural areas as the Landcare movement in Australia is widely perceived as the common ground between the conservationists (ACF) and the farmers (NFF).

A useful description of Landcare education is shown below:

> ... the process that will enable teachers and students to move from accumulating knowledge, developing an understanding and respect for the land; to accepting responsibility and an active involvement in land management practice and strategies (F. Droge, in Hobson and Stadler 1991).

This description highlights the links between awareness, understanding and action. Of particular importance is the action component, a key feature of good landcare education. It is worth noting too that the emphasis is on co-operative learning. It is also necessary to recognise the need to include the wider community as well as teachers and students, since it is the commitment of all sectors of the community that will determine the ultimate success of landcare in Australia.

The underlying concept in landcare education is 'land literacy', that is, "...the ability to read and appreciate the signs of health in a landscape. By implication, this definition also implies the ability to read the signs of ill health in a landscape" (White 1992). Other concepts include emphasising the positives rather than negatives; taking a catchment or regional rather than a fragmented approach and "making the invisible visible", revealing hard to detect problems such as salinity (Hobson and Stadler 1991).

Landcare education also meets the criteria for education *for* the environment as defined by Fien (1993) in: building on education *in* and *about* the environment; developing concern and responsibility *for* the environment, developing an environmental ethic and the motivation and skills to participate in environmental improvement while promoting "a willingness and ability to adopt lifestyle compatible with the wise use of environmental resources".

The Landcare for Teachers Program in Australia

The program aims to reach as many K-12 teachers as possible providing them with a basic understanding of environmental and landcare issues and the need for a landcare ethic. Issues covered include land degradation, water quality monitoring, loss of native vegetation, biodiversity and school-community links. The program aims to provide teachers with the skills and the confidence to introduce a 'landcare' perspective into their teaching, whatever their subject area or their students' grade level. Landcare encompasses a range of disciplines—from science, maths and geography to English, art and drama. It is particularly relevant for teachers with no previous science background.

The program consists of a series of seminars, activities and excursions. It provides a mixture of theory and practical skills aimed at making the introduction of a landcare approach into the curriculum as easy as possible. Since the program began in 1990, it has evolved according to need, but is based on the principles characterised earlier as "reading the land". The approach is positive, emphasising that teachers and students can and do make a difference.

Seminar leaders are specialists in their own area who are able to communicate their knowledge in an accessible way. They are often, but not always, employed in government departments (for example, education, agriculture and forestry) while others are from non-government organisations.

Specific topics covered include soils, geology and landforms, vegetation, biodiversity, the impact of introduced species, the water cycle, catchment management, schoolground planning, composting and earthworms, recycling, waste minimisation in schools and landcare activities in rural, urban or coastal situations. The topics vary, depending on where the course is held and the leaders available.

The target audience consists of K-12 teachers or student teachers, some of whom take the course as part of a teaching qualification at undergraduate or postgraduate level. Since 1990, over 200 Tasmanian teachers have completed the course, while a further 150 in other states have undertaken courses based on the Landcare for Teachers model. The multiplier effect of teachers is one of the most important features of the program, because of their influence on future decision makers and land managers.

The program draws upon the stock of resources already existing in all Australian states. These include books, posters, kits and videos. It was not the intention for the program to develop new resources, but to show teachers what already existed and give them the confidence to use them. A spin-off, however, has been the development of curriculum units by teachers for use in their own situation.

Feedback by Tasmanian participants has been very positive, with a high retention rate of over 90% with a similar proportion reporting a positive response to the program (Chen 1994). The excursions and practical, hands-on aspects of the course are the most valuable activities in terms of their teaching.

The courses are 35–40 hours in length and can be taken as an intensive one-week Summer School program in January or over a period of ten weeks in after-school hours. The exposure to general ecological principles and the mixture of theory, practical activities and visits to look at local landcare problems and achievements means that the course is readily transferable within the same state and country and even between countries.

The major difference between the Tasmanian "Landcare for Teachers" program and the Wisconsin "Environmental Soil and Water Conservation for Teachers" program is in its funding. In Australia, the Commonwealth Government, through the National Landcare Program (NLP) has shown its support for education by providing funding to enable teachers to undertake the course at no cost to themselves, unless they wish to obtain university credits towards a degree.

Catchments, Corridors and Coasts

Among teachers who have an existing knowledge of landcare issues, there is now a demand for a more "advanced" course linking landcare more closely to curriculum areas. This led to the development of the "Catchments, Corridors and Coasts" course as part of an Australian Association of Environmental Education and National Professional Development Program initiative. The first course was offered in January 1995, in three Australian states and is available at postgraduate level in Tasmania.

Conclusion: Gaining New Insights - Building on Experience

Inspired by the Wisconsin course, the Landcare for Teachers program has evolved to suit Australian educational, environmental and social conditions. The original concept was sound and has shown itself to be readily transferable to other places. The landcare movement generally is playing a significant part in changing Australian attitudes and behaviour towards the land; in the growing number of teachers in all states who have been exposed to the Landcare for Teachers Program, there is an increasing acceptance of the long-term value of educating the wider community. The program is a good example of the benefits of building on experience and thereby gaining new insights.

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Tanner's Twenty-Seven

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Decades of analyzing environmental controversies have led the writer to produce an ever-growing list of ideas (theses, propositions, constructs) which he believes may have some explanatory power. A sample of twenty-seven follows.

Economics

- Sound environmental practice is sound economic practice. Activities with negative environmental impact, such as overlogging and polluting, may enhance short-term economic gain for a few but produce long-term economic loss for many.
- Western-style industrialized cultures are predictably nonsustainable. This may be more true of the U.S. than of some other cultures of this type.
- The *economic* system of the U.S. is not (yet) well suited to maintain itself on a sustained basis, in part because it is geared to unidirectional flow of material resources, from raw materials at one end of the flow to waste materials at the other, with profits related directly to the volume of the flow and with as yet inadequate provision for reuse, maintenance, repair, and efficiency.
- Evolution toward sustainability has the potential to create significant new growth industries and entrepreneurial opportunities, which now face inequitable political barriers, especially perhaps in the U.S. Those who delay such progress are organized to do so, while the public is less organized to promote and defend the public interest. This idea leads directly to:

Politics

- The *political* system of the U.S. is not (yet) well suited to the attainment of sustainability. Wealth and power concentrated in the private sector exert disproportionate influence on the public sector, e.g. pressures on federal agencies, large campaign contributions to Congress.
- Since profits (as yet) accrue to the destruction, alteration, or unidirectional flow of material resources much more than to their protection and husbandry, there has been much more money available to influence our political system in nonsustainable than in sustainable directions.
- On matters of environmental quality and sustainability, there has long been a marked difference between the two major political parties. This difference is quantifiable and irrefutable, for instance, in Congressional votes and Presidential appointments. This difference is clearly attributable to the different constituencies historically courted by the two parties, with one being especially accountable to those who profit most from the rapid flow, alteration, or destruction of material resources. Today, large corporate contributions to both parties threaten to blur the distinction.
- Money gained from the rapid alteration, destruction, or unidirectional flow of material resources also affects the political climate by lowering the quality of public information and thus of public discourse. For instance, this money underwrites the production and distribution of free literature and films, to a magnitude which cannot nearly be matched by

those with opposing views and other information. Likewise, influence is exerted on the mainstream press, both print and nonprint, through direct ownership or advertising revenues. This may cause environmental and other public issues to be covered superficially, at best. At worst, it may manipulate public opinion against scapegoats and the more outspoken environmentalists.

- Some historians have posited a cyclicity in American political and economic life, with periods marked by the ascendance of selfishness, civic irresponsibility, corruption, and even repression alternating with periods of reform; one historian refers to these as periods of Private Interest and Public Purpose. If this model has any validity, then (a) government and corporate abuse of environmental and other public goods seems to be especially intense during the former periods, (b) the White House tends to be occupied by that political party best representing each period, (c) the 1980s conformed predictably to the Private Interest phase, (d) that phase has apparently extended beyond its predictable conclusion circa 1990.
- There may be a tendency for aggressive, self-seeking persons to attain power in the major institutions of industrialized and industrializing cultures. To the degree that this is so, will those institutions and their upper echelons mutually reinforce their dedication to acquisitiveness and growth, with environmental degradation and social inequity as results. This tendency has been especially noticeable in the U.S. since about 1980, e.g. Reaganomics, deregulation, corporate takeovers, golden parachutes, the Contract with America and the 104th Congress.
- Public agencies are created to achieve specific public goals, but after a time their actual primary objectives
- become survival and expansion. This helps to explain behaviors which are sometimes inconsistent with their stated mission and the public interest, and which may sometimes be illegal.

Culture and Cultures

- Ecologically benign, sustainable cultures and their accrued wisdom have been and are being eradicated by arrogant and predictably self-destructive ones.
- Much of the development assistance offered by more developed to less developed countries has been environmentally destructive, culturally disruptive, economically unsound, and of inappropriate scale. Much of the "assistance" may have been motivated more by goals of profit, prestige, and power for the few than by concern for the many.
- International trade agreements and talk of a "new world order" may be overly inspired by multinational corporations whose activities are a potential threat to the planetary environment and sovereignty of the world's peoples. The names and operations of some of these companies are not well known to the public; their influence may have been especially great since about 1980.
- The continuing growth of human numbers is a disaster in the making, now finding obvious expression in *all* regions of the world. With the planet's human population now five times greater than it was less than 200 years ago and twice what it was just forty years ago, its people are engaged in a vast out-of-control experiment holding no persuasive prospect of success.

- Machismo seems to be an environmentally destructive force, whether expressed as large families in Latin America or the hostile takeover of a California lumber company. The latter example is a logical expression of the aggressiveness and assertiveness deemed desirable in the culture of the contemporary corporate community, values seemingly inconsistent with gentle treatment of other communities, human or otherwise.
- Those thoroughly acculturated by pop and mainstream cultures may not willingly consider, easily understand, nor readily accept ideas such as these; those who would protect the earth and promote sustainability must be prepared for such responses.
- Much of what happens in contemporary culture is driven by doctrines that are arguably or patently false, such as the superstition of technological optimism and the myth of limitless growth, both necessarily based on imprudence and an ignorance of the facts taught by ecological and environmental studies. These doctrines are tolerated or actively promoted in significant segments of corporate America, government, academia, church, and other institutions.
- Environmental amenities are of profound aesthetic, spiritual, and cultural as well as economic value. The loss of varied habitats and species diminishes the earth not just as a source of goods, but as a source of joy.

Environmentalists

- There is a fundamental inequity in battles over public policy. Environmental and other public interest groups are supported by voluntary donations, while their government and corporate adversaries are financed involuntarily by all of us, as taxpayers and customers.
- Environmental groups win holding actions, not final victories. There are at least two basic reasons for this, one financial and one ecological/physical: (a) After a victory, environmentalists must redirect their limited resources to other issues. Their better-financed opponents quietly stay with the case, eventually effecting actual or de facto reversal. (b) Losses by environmentalists tend to be less reversible on the ground than are their victories. A dam defeated is only a dam delayed, but a dam constructed is, for all practical purposes, a final resolution of the controversy.
- In these battles, the environmentalist position merits serious consideration and an assumption of credibility, for at least three fundamental reasons which comprise the next three ideas.
- The environmentalist community has a better track record than do its adversaries. If a problem is identified as such by a number of mainstream environmental groups, they tend to be vindicated eventually by the facts and by public opinion. Note that past and present environmental problems were often caused by those who, then as now, dismiss the environmentalists as ill-informed and misguided.
- Economic self-interest is clearly the adversaries' motive in most environmental battles. When truth and self-interest conflict, the latter is likely to prevail in shaping one's public statements. This has often been demonstrated in these battles.
- The course typically advocated by environmentalists is that of caution and restraint — a conservative allowance of margin for error. This would seem to be the prudent course, given the limits to growth imposed by the planet's finiteness, and the degree to which those limits have now obviously been approached or surpassed.

Other

- Although environmentalists win holding actions and even reversals, the trend of environmental quality continues to be a downward one. Many of the ideas in this paper help to explain why this is so: environmental problems are but symptoms of more profound ones.
- As discouraging as many of the preceding ideas may seem, there are positive and effective steps one may take as citizen, consumer, parent, investor, employee, or entrepreneur, to slow and—one may hope—reverse prevailing trends.

Does It Bite? Can I Pet It? Evaluating and Improving Educational Programs Using Live Animals

Pat Tucker and Bruce Weide

Wild Sentry: The Northern Rockies Ambassador Wolf Program

Introduction

If a picture is worth a thousand words, the presence of a live animal is worth a thousand pictures. All environmental educators know the attraction of having a live animal visit a classroom or museum. These programs are popular and can provide a valuable learning experience for children and adults. Unfortunately, many programs are directed by well-meaning, but unknowledgeable people, who create as many misconceptions as they dispel. As a result, many educators are rightfully ambivalent about live animal programs. This paper presents a series of questions that educators who host live animal programs can use to evaluate the caliber of a program before it is presented. Also included are ideas for research and discussion that educators can use with their students before and after the live animal program to increase the program's effectiveness and learning value.

Understanding the attraction, value and dangers of live animal programs

While not many would debate the fascination that living animals hold for people (more people visit zoos annually than attend all sporting events combined [Kellert and Wilson 1993]), it is only recently that there has been a scientific attempt to explain this characteristic of human behavior. The biophilia hypothesis postulates that the human brain evolved over millions of years to be attuned to and interested in different life forms: that the more interested a human was in his or her living environment, the more successful he or she would be, and hence the more likely to reproduce and pass this innate behavior on to its offspring (Kellert and Wilson 1993).

Given the genetic predisposition for humans to desire viewing and being close to animals, bringing a live animal into a classroom can further educational goals for a variety of reasons. First of all, it sparks the student's interest; initiating the first step in the learning process. Secondly, since the program is anticipated and perceived as fun, students will, with guidance, readily and eagerly learn more about the animal. The series of questions and discussion topics found in Table 1 can help an educator guide this research. Additionally, the presence of the real animal alters an imagined vision of animals better than photographs. This is particularly important when dealing with animals that play important, and often negative, roles in stories and movies (i.e., wolves, bats, snakes).

While these programs can be effective, to avoid the misconceptions and dangers inherent in them requires that they be carefully evaluated by the host before they are invited and that the students be properly prepared (Table 2). Among the misconceptions that can be fostered is the idea that the animal is a pet. Another inherent danger of live animal programs is that students will come away with a great interest in the animal as an individual but with little knowledge, or worse misconceptions, about its behavior in the wild or of its habitat requirements. Project Wild's activities "What's Wild" and "Animal Charades" can help students understand the differences between wild reared, captively reared and domesticated animals, as can the article "How to Pick a Pet" (Luther 1985). Additionally, Table 3 contains a series of questions and discussion topics on this issue. While people of all ages enjoy being close to animals, children under eight years may be cognitively unable to distinguish the difference between a pet (domesticated animal) and a wild animal in captivity. Young children are probably as satisfied with seeing a domesticated animal as a wild animal and hosts should carefully evaluate how their money can best be spent. The questions and research topics in Table 1 will help students see the animal they're viewing in the context of its species and habitat requirements in the wild.

In addition to the above dangers, there are simple factors of safety for the students, humane considerations for the animal to be exhibited, the legality of the program and the expense of the program that need to be carefully evaluated by the hosting group. Table 4 is a series of questions that an animal exhibitor should be asked prior to presenting a program.

Program effectiveness can be greatly enhanced if, after the program, the students are assigned to write thank you letters to the presenter stating one to three things they learned and what they liked most and least about the program. This will help you, the host, discover misconceptions that need corrected and help the presenters improve their program. In class discussions of important points, what the students liked or didn't like, was it better than seeing a good movie or reading a book about the animal? why or why not? are important and should be encouraged as should further research.

Follow up letters to the presenter, from the host, should include an evaluation of the program with praise for strong points and suggestions if there's weak points or ways they could reach that age group better. This information will not only assist the presenters in improving their program but can be used to help generate funds to continue their educational work.

Conclusion

Live animal programs can be effective in teaching students about the natural world. People are innately attracted to animals and this attraction can be used to encourage an interest that goes far beyond the individual animal and addresses the importance of habitat. In order for these programs to be effective teaching aides, exhibitors and hosts must work together to assure that the programs are of high quality and do not perpetuate misconceptions.

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Table 1 - Topics for students to research about the species before a live animal presentation:

1) Eating habits (how, what)
2) Home range or territory size
3) Social or solitary (group sizes, how groups are formed)
4) Ways of communicating
5) Daily activity patterns, annual activity patterns
6) Time of year born, how many to a litter, age to maturity
7) Life span
8) Size, weight
9) Evolution/Taxonomy
10) Type of habitat needed
11) Adaptations for their life style and environment
12) Geographic range of species
13) Status of species in the wild: if declining, stable or increasing, why?
14) Relationship to other species/ecological contributions to environment
15) What stories are told about the animal? How is it portrayed in books, movies, advertising, etc.?
16) Do other cultures view the animal differently than we do?
17) What cultural values are underscored by our portrayal of the animal?

Table 2 - Preparing students for live animal programs:

1) Discuss the differences between wild and domestic animals:
    –Project Wild activities: "What's Wild?", "Animal Charades"
    –Ranger Rick June 1985 article: "How to Pick a Pet"
2) Discuss characteristics of a good pet (not dangerous, enjoys being with people, gets along with pets, doesn't chase wildlife, content when leashed or penned, doesn't require more time than you have to give it)
3) Evaluate the animal they will see as to its suitability as a pet (Table 3)
4) Discuss reasons for captive wildlife: education, research, propagation for release in the wild, entertainment, stroking owner's ego, rehabilitation. Are any of the reasons better than others (student opinion and discussion)?
5) Why is the animal they're going to see in captivity? Why are the people with the animal qualified to have it?
6) Discuss what behavior students are expected to display and why they must display it (animal's comfort, student safety, etc.). What are the consequences if they fail? (preferably not that they'll be eaten)
7) Research animal's basic natural history and learn how it lives in the wild (Table 1)
8) Discuss careers they should consider if they want to work with wild animals and the academic and experiential qualifications that will enable them to pursue these careers.

Table 3 - Evaluating an animal's suitability as a pet and whether a person can meet its needs:

1) Is it a social animal? If so, how will those needs be met 24 hours a day? Can humans fulfill its social needs?

2) How much space does it need? (research territory, home range sizes,)

3) What's the temperature range it's comfortable in?

4) Is it dangerous or a nuisance if it's loose? (kills or chases pets, bites, eats flowers or shrubbery)

5) Will it be safe if it's loose? (get shot, lost, hit by car)

6) If it has to be confined at all times, what sort of fencing does it need? (contact a zoo, wildlife department)

7) Is it legal to have the animal? What sort of license is required? (federal, state, county, city)

8) What kind of food does it eat? Will I always be able to obtain this food?

9) How much exercise does it need? How much does it travel during the day in the wild?

10) What are its daily and annual activity patterns? (Is it asleep all day and active all night?, hibernate or estivate?)

11) How much time will it need every day to meet its physical and psychological needs? (What happens when I go on vacation, graduate, get another job?)

12) How long does the animal live? (What sort of changes might I expect in my life that might make me unable to continue caring for the animal for its entire life: going to college, having kids, new jobs, moving, etc.)

13) How much would it cost to feed and care for the animal for a year and build adequate fencing and shelter?

14) Why would I want this animal?

Table 4 - Questions for the hosts of live animal programs to ask prospective presenters

1) What are the license requirements for the species you're exhibiting? Does your program comply? Request that exhibitor send a copy of their permit.
–Mammals: federally regulated under Animal Welfare Act. Exhibitors must have a federal exhibitor's permit (for more information contact Dept. of Agriculture; APHIS), states, counties and cities may have more stringent requirements and vary widely
–Migratory birds (nearly all): federally regulated under Migratory Bird Treaty Act. Exhibitor's must have a Possession Permit, and/or Eagle Exhibition Permit (required if any species of eagle is being exhibited), and/or Falconer's Permit (for more information contact Department of the Interior; USFWS; Division of Refuges and Wildlife, Migratory Bird Management Office), states, counties and cities may have more stringent requirements and vary widely
–Amphibians, reptiles, fish, insects: not federally regulated, may be regulated by state, county or city ordinances
–Endangered or Threatened Species of any of the above: federally regulated under the Department of the Interior, USFWS, Endangered Species Division, Law Enforcement
–Exotic or non-native animals of any type often have special regulations. Sometimes the regulations are to protect the species (i.e. tropical fish, parrots), sometimes to prevent release and subsequent problems (i.e. to prevent repeats of the starling, English sparrow debacle)
2) Would you please send two references (one from professional educator, one from biologist)
3) What are your credentials? (academic and experience)
4) What is the program format?
5) What are the three main messages of the program? (What is your view of this animal as a pet? Is that discussed?)
6) What is expected student behavior?
7) How long is the program?
8) What is the appropriate student age for program?
9) What is the appropriate number of students?
10) Is there a fee? How is this program supported?
11) How long have you been doing programs with this animal, this species, captive animals?
13) How can I prepare my students to better appreciate your program? Do you have any materials you can send me?
14) How do you ensure safety of the students? What are the potential dangers? Are students allowed to touch the animal?
15) Do you have liability insurance?
16) What space, and/or facilities are needed? Parking?
17) How is the animal handled? (leashed, caged, held, etc.)
18) What assurances can you give me that the animal is treated humanely?
19) Why is the animal in captivity? What is the main focus of your program or group (education, rehabilitation, selling animals)?

Evaluating EE Programs: From Planning to Process

Carol Walker, Steven Bissell, Don Hollums, Marcella Wells

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Millions of dollars are spent each year creating and disseminating environmental education programs and materials to educators, students, and citizens across America. Yet strategies for measuring the effectiveness of national programs are scarce. As programs and materials proliferate, so does the need for evaluating those programs and materials.

Why Evaluate?

Are today's students environmentally literate? Will they become responsible adults who can manage the complexities of the environment? Unfortunately, there is scant research or evaluation regarding the nation's environmental understanding/knowledge—a term we will identify as environmental literacy.

In view of the current national movement toward content standards and evaluation, it is imperative that environmental educators have baseline data on literacy. A comprehensive and reliable assessment would be a direct and immediate benefit to major environmental education providers such as federal state wildlife agencies. The results of assessments and evaluations will establish criteria from which to direct and modify efforts most effectively.

There is truly an educational revolution—most prefer to call it a restructuring—in the nation's schools based on providing new ways of assessing student knowledge and performance. Environmental education, especially wildlife related education, needs to be aligned with these changes.

A large number of designs are used in assessing environmental knowledge and skills. As reported in the literature, environmental education has been notoriously difficult to evaluate. One 1980's study reported in the *Journal of Environmental Education* found that only 7% of 284 EE programs had a formal evaluation component.

Part of the difficulty lies in the nature of environmental education . . . it permeates all segments of the curriculum and tends to be highly affective as opposed to cognitive. Therefore, the methodologies used to evaluate EE have been qualitative rather than quantitative. This is not a criticism of EE evaluation. Qualitative evaluation is at least as strong in most areas as quantitative and is superior to quantified research in terms of validity. There are advantages and disadvantages with each method. The methods most commonly seen in the literature are pre- and post-treatment tests; case studies, histories and testimonials; interviews and focus groups; open-ended surveys; and experimental design with control groups.

Why do we evaluate? In education we want to know more than mere numbers. Current trends favor assessing environmental literacy. Wisconsin is the only state with legislatively mandated environmental literacy of students. Missouri recently assessed a random sample of 6th and 12th grades. Pennsylvania and Louisiana are positioned to provide state-wide testing for environmental knowledge within their basic curriculum reform, especially in science.

If environmental educators can establish essential concepts at various grade levels in a formal document, we believe they can be infused into content benchmarks, frameworks, outcomes and standards on an ongoing basis. The standards, like all curricula, are constantly changing. Essential EE concepts can be integrated into the inevitable changes.

Since EE is not recognized as a separate and distinct content, EE concepts are embedded into the "basic" content areas. Colorado has adopted state standards for math, science, geography, reading and history. EE concepts are infused within, particularly in science and geography.

Environmental Education Programs in Colorado

Data collection for the study involved contacting environmental organizations, special interest groups, governmental and non-governmental organizations, and educational associations. Data analysis and interpretation examines where environmental education activities and programs are centered, what information is at the center of most programs, what kind of program is most popular, who is being reached by these programs and what organizations are participating in environmental education.

The central audience focus for most environmental education programs was the general public judged by organizations to be at a beginner skill level. This indicates that most programs are organized for anybody who shows up with little or no background knowledge pertaining to the subject matter presented. Elementary students are the second highest audience group and middle school students come in third. Preschool children, business and industry and senior citizens are receiving little, if any, formalized or targeted environmental education.

The most striking portion of the results of this study indicate that less than half (45.2%) of the organizations presenting environmental education activities and programs have any type of evaluative data. That includes everything from a count of how many people participated in the activities to a formalized case study. If there was any evaluative documentation on a program, most often it was in the form of a program review. Program reviews usually ask questions such as: What did you like about the activity? How can we make it better?

Most of the programs and activities involved general environmental education principles (45.2%). Other types of content topics for activities included wildlife (31.8%), biodiversity/ecology (18.8%), lakes/ rivers/streams/wetlands (13.2%), and recreation (11%). Content topics that were not selected as being part of environmental education activities included chemical/biological contamination, transportation, energy, human population planning, noise pollution, biotechnology and international development.

From this survey it is conjectured that most environmental education programs and activities in Colorado are organized by publicly funded organizations and agencies. Most programs seem to be recreation based for the general public on a local level. Environmental issues and problems are not addressed and action/advocacy components of environmental education, as described in definition and theory, are missing.

Project WILD and Standards Evaluation

The State of Colorado has formally adopted education performance standards. For agencies, and other environmental education providers it is essential to know how or whether their material and/or programs conform to the standards as, from a practical view point, classroom teachers will be mostly likely to use material which meets the requirements of the state standards.

Kristen Powell, a graduate student at Colorado State University, is testing Project WILD (PW) against a standard teaching system: Full-Option Science System (FOSS). This project is an experimental evaluation, not only of PW, but of the effectiveness of PW to teach a specified standard.

The test will consist of matched classes of fourth grade students being given identical pretests based on a Colorado State Science Standard. Each classroom teacher will then receive a packet of instructional material, one-half of the classes receiving PW activity based instructions, one-half receiving FOSS based material. Following the classes completion of the material, each class will receive identical tests based on the state science standard. Teachers will not be aware of the nature of the tests to avoid "teaching the test" bias.

The observed differences in this experimental evaluation will be used to 1) assess the effectiveness of PW as an experiential approach to teaching specific standards and; 2) determine if there are differences in the standard based performance of students taught with experiential material as compared to full-cycle learning material.

Since Project WILD is one of the most widely used EE curricula supplements, the EE program of the Colorado Division of Wildlife is heavily reliant upon its use. We wished to determine if PW could be used to teach and assess state education standards.

Wendy Hanophy, of the Colorado Division of Wildlife, has developed a correlation of PW and Project Learning Tree (PLT) activities to Colorado State Education Standards . The correlation shows whether or not the PW or PLT activity can be used to teach and/or assess the state standard. The correlation's are based on the PLT or PW activity and on the specific standard.

In October of 1995 each school in the state, each Board of Cooperative Educational Services (BOCS), each University and all PW and PLT facilitator will receive copies of the correlation on computer disc and as printed material. The medial center or library at each school in the state will receive complete documentation on the computer programs, which are in both DOS and Apple format.

Finally it is necessary to establish policy about standards and evaluation. In order to address the segment of environmental education which deals with wildlife conservation, a meeting of twenty state wildlife management agencies was held in Denver in 1995. Based upon the two day discussion of agency needs in evaluation, the agency personnel felt that evaluation needed to address the issues of what is worth knowing and why, what will be the policy implications of evaluation, who or what is to be evaluated and, are the recipients, the providers, the outcomes or the methods to be evaluated? Also how will evaluation be performed from a methodological view. Finally , what will be done with the results? Will they be used in budgets, planning, accountability, policy change, program change, systematic change or validation of program effectiveness/efficiency.

Conclusions

Based upon our work in evaluation, assessment and standards we have made the following conclusions concerning evaluation.

1. There is no prescriptive approach to evaluation. Evaluation should be based on local circumstances and needs.
2. Evaluation should include formal and non-formal educational experiences and opportunities.
3. Evaluating environmental education is not a single task. You should select the area where you have the most expertise and you should define your objectives at the

earliest possible point in the evaluation. You must establish specific criteria to evaluate.

4. Knowledge cannot be measured as yet. Decide if you are measuring efficiency, effectiveness-learning, impact-behavior, or program objectives.

We feel that, although our work is mostly empirical, we are moving towards experimental, qualitative and quantitative validation. We will continue with evaluation projects in conjunction with on-going programs. Finally, we are committed to the use of educational standards and the support of the classroom teacher in environmental education.

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School-based Development of Environmental Education in Vocational Education

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Introduction

In contrast with elementary and secondary education, environmental education has received relatively little attention in higher and vocational education. This is surprising considering the potential impact graduates from higher and vocational education institutes can have on the environment by the decisions they make and the actions they take in their professional lives. Within the European Union we have only recently seen attempts by national governments to encourage the integration of environmental education in the curriculum of institutes of higher and vocational education (Bartlett 1993; Biehler-Baudisch 1994; REIFEA 1993).

Although this paper focuses specifically on agricultural education, some of the dilemmas, challenges and recommendations have bearing on vocational education in general. We will briefly outline a three year research project that involved the school-based development of the environmental dimension of environmental education (Alblas, et al. in press). Subsequently we will present sixteen so-called learning enhancement criteria for environmental education that can be utilized by teachers both in their teaching and curriculum development.

Environmental aspects of agricultural vocational education

Although agricultural education is only one of the factors shaping the professional role of farmers, it does play a role in the process of re-orientation towards economic and environmental sustainability. Teachers and students in agricultural education should have a basic conceptual understanding of the structural changes in agricultural production and their relationship with nature and environment. One of the main challenges in developing the environmental dimension of agricultural education is to organize learning processes which explore, develop and nurture the values that are necessary for an agricultural production system which is stable enough to sustain an ecologically and economically healthy future.

Traditionally vocational agricultural schools have focused on the transfer of disciplinary organized knowledge and skills. The main aim was to equip young adults who would be employed in agri-business with the knowledge and skills that would enable them to turn land, water, soil, sunlight and minerals, with the help of domesticated animals and cultivated crops, into a profit. Students needed to master a body of knowledge and learn to utilize a bag of tricks that would increase their chances of becoming profit-making professionals. This 'body of knowledge' and this 'bag of tricks' was seen as a product of scientific research and technological advances respectively which were both accepted as valid, appropriate and trustworthy. Science and technology have been the two most important driving forces of modern agriculture. Even environmental problems in agriculture were viewed as technical problems which required a new body of knowledge and new tricks to add to the bag.

The transfer of knowledge and skills is only part of education. Social development and so-called higher level learning goals such as moral reasoning, critical thinking and problem-solving, long have been neglected in many educational systems. Education, agricultural education included, has an important role in enhancing the lives of students by adding learning for being (Bawden and Macadam 1991) to the traditional domains of learning for knowing (science) and learning for doing (technology). Environmental education brings new elements to many vocational schools that stem from a different outlook on teaching, learning and being.

Researching environmental education in agricultural education

In our research we particularly focused on the relationship between environmental education goals, contents and learning process. The guiding research questions we focused on were:

I. How can the practical theories of teachers bridge the gap between environmental education theory and practice in the context of vocational (agricultural) education?
II. What didactic criteria should environmental education meet to become a significant part of regular vocational agricultural teaching and learning?

Our research adheres to two main guiding principles: 1) attempts to integrate environmental concepts and environmental education into the core curriculum of agricultural schools should complement other educational reforms that are taking place, and 2) educational change and reform succeed best when the entire school community is involved in the development, implementation, evaluation and re-defining of the innovation at stake (Bawden 1994; Elliott 1991; Robottom 1987; Wals 1994a; Wals 1994b).

Given the importance of involving the school community in the development, implementation and evaluation of educational change or an educational innovation, an action-research approach was used. Action-research here means the blending of theory and practice in such a way that those who will be most affected by any changes that result from the research are also the ones who help determine what theories and experiences are most meaningful and relevant. The blending of theory and practice involves *praxis*, a spirally developing concurrent process of evaluation, reflection and action (Lewin 1946). While participants are engaged in a problem-solving process, they are reflecting on their work and its effectiveness continuously. This is an active process in that the participants seek out the information they need, define their problem and develop a range of solutions.

Throughout the research participants are assisted by an outside researcher whose task it is to create the right conditions for action research, to facilitate praxis, to bring in new information and to systematically collect the participants' experiences in order to document the research and disseminate the findings to other settings.

Figure 1 illustrates our research approach by showing some central features such as:

- the collaboration and interdependency between academic and practitioner researchers;
- the problem solving nature of the inquiry process of all participants;
- the spiral development of the inquiry process and its reflective nature;
- the development of so-called praxis-theories both rooted in theory and praxis; and
- the dialectical nature of inquiry.

Learning enhancement criteria for environmental education

An important input and output of the research consists of so-called learning enhancement criteria for environmental education(Alblas, et al. 1993; Janssen, et al. 1994). Teachers from both secondary and vocational agricultural schools were asked to reflect on their own ideas about 'good' environmental education practice. An analysis of these reflections led to sixteen criteria (Table I). The criteria are not listed in any type of order and are intended to help teachers in reflecting on their own teaching and to assist them in developing new teaching materials. It should be noted that all examples are related to (Dutch) agricultural education.

Discussion

It should be noted that 'good' environmental education does not have to meet all the criteria listed in Table I. In all likelihood a subset of criteria will have to be considered depending on the context and purpose of the learning process. The criteria should not be seen as an evaluation device, but more as a tool for constructing and for reconstructing teaching and learning.

The learning enhancement criteria were valued by the teachers who developed teaching modules. Firstly, they could relate to many of them intuitively or from personal experience. Secondly, the criteria enabled them to look more critically and systematically at their own teaching and teaching materials. As a result the teachers could now identify strengths and weaknesses in the teaching materials they had previously developed. Finally, the criteria made them rethink the relationship between learning objectives, learning contents and learning process (i.e. the criterion of problem-based learning cannot be met by a lecture).

The use of the enhancement criteria has also unearthed some potential shortcomings or areas in need of improvement. Each criterion leaves a lot of interpretation space, making it easy for teachers to say "Oh, I always do that". Some of the criteria do not easily coexist (i.e. sufficient time and discovery learning). In addition, the criteria may prove to be quite contextual and transfer to other areas of education may require some modification. So far, the learning enhancement criteria seem to be a useful tool for developing the environmental dimension of agricultural vocational education. Nonetheless more research needs to be done to find out the extent to which the criteria are transferable to other educational settings and to get a better sense of their effectiveness in helping teachers design new learning activities.

The research does indicate that actively involving teachers in curriculum development through action research does challenge them to take a critical look at their own teaching and teaching objectives. As a result they are more inclined to actually use the teaching materials they themselves have developed.

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Figure 1. A model of action research-based educational research

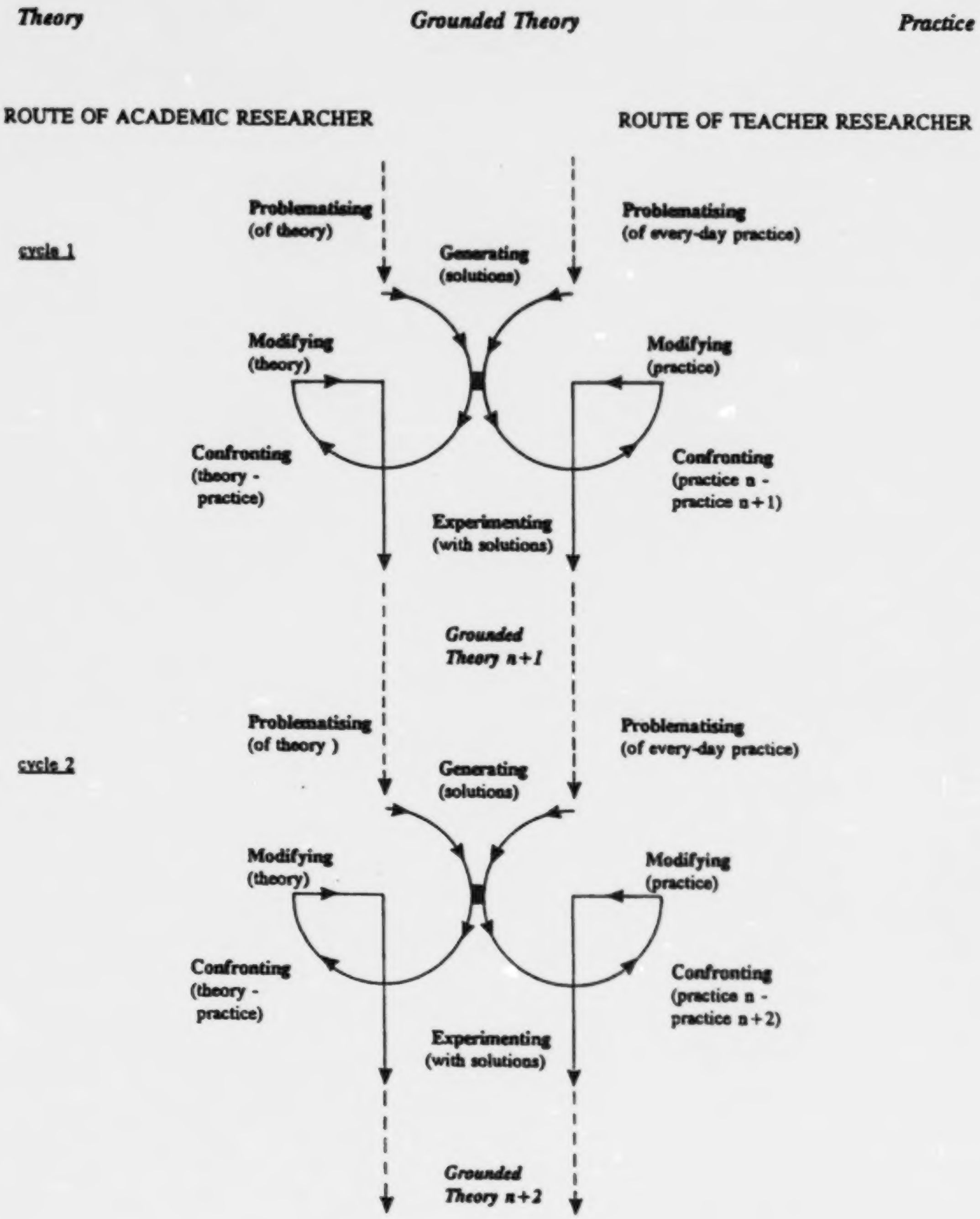
Theory
Grounded Theory
Practice
ROUTE OF ACADEMIC RESEARCHER
ROUTE OF TEACHER RESEARCHER
cycle 1
Problematising (of theory)
Generating (solutions)
Problematising (of every-day practice)
Modifying (theory)
Modifying (practice)
Confronting (theory - practice)
Confronting (practice n - practice n+1)
Experimenting (with solutions)
Grounded Theory n+1
cycle 2
Problematising (of theory)
Generating (solutions)
Problematising (of every-day practice)
Modifying (theory)
Modifying (practice)
Confronting (theory - practice)
Confronting (practice n - practice n+2)
Experimenting (with solutions)
Grounded Theory n+2

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Table I Learning enhancement criteria for environmental education

CRITERION	CONCEIVABLE RESPONSE	EXAMPLE OF CONTENTS
1. **Recognizable** in daily life	+ "That's not how we do it at home..." - "I suppose so... I'll study it for the test but..."	*Right*: studying the environmental impact of herbicides on local crops *Wrong*: studying the environmental impact of DDT in developing countries
2. **Usefulness** in daily life	+ "I will check whether they do this on my internship farm..." - "Why on earth do I have to know this?"	*Right*: learning how to apply ecological guidelines in stream border management *Wrong*: investigating the decline of the otter
3. **Connected** to past experience	+ "Come to think of it... I once visited an eco-farm where they..." - "All that theoretical stuff... I have never seen that on our farm..."	*Right*: analyzing a familiar crop rotation scheme and looking for alternatives *Wrong*: discussing the environmental impact of fertiliser production
4. **First hand experience** of phenomenon at stake	+ "I can't believe I get such a high reading!" - "It says so in the book..."	*Right*: sampling and analyzing soil micro-organism *Wrong*: only reading about micro-organisms in the soil
5. **Accurate observation** using all senses	+ "I had no idea a single worm could do all that..." - "Don't bother. We looked at this last year too..."	*Right*: observing the development of a yeast disease on a crop *Wrong*: memorizing a list of yeasts harmful to potatoes
6. **Reflection** on past experiences (behaviour, feelings)	+ "No way! I saw it with my own eyes. It had no effect at all..." - "Do you really believe these guys know anything about farming?"	*Right*: reconstructing a visit to an eco-farm *Wrong*: providing a summary of the main outcomes of the Rio Earth Summit
7. **Action-oriented** to develop responsibility and care	+ "We should find a way to reduce the use of minerals..." - "I can't change that! Someone else should do it first..."	*Right*: developing a plan to increase bio-diversity on and near the farm *Wrong*: lecturing about the causes of acid rain
8. **Cognitive dissonance** leading to a rethinking of prior knowledge	+ "Funny... I always thought that..." - "Tell me something new!"	*Right*: discussing viable environmentally sound alternatives to pest control *Wrong*: memorizing alternative pesticides
9. **Social conflict** to pique curiosity and to stimulate discussion	+ "I don't know whose side I am on any more..." - "Nobody would disagree with that..."	*Right*: discussing overproduction and starvation *Wrong*: discussing CFC-free cooling systems
10. **Socially acceptable** or not too threatening for the community of	+ "It won't be easy, but I will raise this issue with my folks back home..." - "Yeah, right! Do you really believe I can discuss this at home?"	*Right*: studying measures that can reduce the loss of minerals in pig farming *Wrong*: proposing that the environment would benefit greatly

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which the school and the students are part		from banning all modern pig farming
11. **Intellectually challenging** in that students need to raise their thinking and acting to a higher level	+ "This is tough, but at least I feel like I am getting somewhere..." - "Sure I can do that. No problem!"	*Right*: looking for new perspectives to redefine an old problem *Wrong*: solving seemingly different issues that require the same logical reasoning
12. **Theoretically deepening** to enhance and broaden knowledge and understanding	+ "This is interesting. I would like to know more about it..." - "I am bored stiff! When does the bell ring?"	*Right*: determining the position of the farm in the food chain *Wrong*: listing the environmental impact of chlorine
13. **Problem-based** to develop problem solving skills	+ "Suppose we recycle the water we use to rinse the milk machines..." - "Will this be on the test? Why are we bothering?"	*Right*: studying weeds as bio-indicators for soil quality and determining environmental hot spots *Wrong*: dissecting a worm
14. **Varied and diverse** to accommodate the interests and abilities of the individual student	+ "First I will look for alternatives then I will..." - "Why do we have to talk about this all the time. Can't we look it up?"	*Right*: looking at bio-diversity in a local creek *Wrong*: looking at a film on the life of a whale
15. **Sufficient time** to study issue in depth	+ "This surprises me. I have to go back and look again..." - "I can't keep up. I might as well quit..."	*Right*: investigating the environmental impact of one particular farm extensively *Wrong*: getting a general idea of the environmental impact of dairy farming
16. **Discovery learning** to enter new realms of experience	+ "I wonder what would happen if we would add..." - "I could just as easily read that in the reader..."	*Right*: examining a soil sample on the presence of micro-organisms *Wrong*: reading about the impact of nitrogen on surface and ground water

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Unique Program Strategies for Youth Water Education

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Youth water education programs exist in little pockets all over the world, that's the nature of water—it's everywhere. Youth coordinators define specific program objectives but the overall goal of water education programs is to inspire youth of all ages to take an interest in water resources, learn how their actions affect water, become active environmental stewards, and ultimately, carry their learned behaviors into adulthood.

Water program coordinators around the country strive to encourage citizens of all ages to become socially conscious about water resources; to work toward the common good. Sheldon Berman, President of Educators for Social Responsibility states that "social responsibility—that is, a personal investment in the well-being of others and the planet—doesn't just happen" (Berman 1990a). Berman examines the question, "What motivates one individual over another to develop social responsibility?" According to his research (Berman 1990b), the answer lies in a child having positive role models—adults with an empowering relationship with society. Those role models, Berman claims, take the form of parents, teachers and community leaders.

What attracts youth to take part in water education programs? How can the program design enhance skills a young person needs to develop both socially and intellectually? Several water programs coordinators throughout the country recognize water education as a means of addressing social and economic issues that involve youth directly, as well as the opportunity to develop environmental stewardship skills. Many programs confront such youth issues as drugs and alcohol, crime, dropping out of school, unemployment/underemployment, lack of career options, critical thinking skills, and life skill development. In Austin, Texas, for example, river monitoring works to keep high school kids from dropping out. Elementary students in East Troy, Wisconsin use fishing as a deterrent to drug and alcohol use. Research into restoration techniques along the Bronx River in New York offers employment and higher education opportunities for urban youth. And week-long 4-H water camps in Monahans, Texas highlight industrial and agricultural water use in arid regions of the state, hoping to spark interest in future natural resource managers.

These specific program coordinators identified the social issues **and** water education needs of the young people in their communities. Incorporating both needs into a water education program requires defining the target audience critically; not just the age range, but what's going on in the kids' lives—from home and school to neighborhood. From this point, the coordinator customizes the program where the youth participants, the community and the environment benefits as a result.

Nonformal education settings

Water's ubiquity and applicability allows for a variety of educational settings that appeal to youth. To better organize our research findings for *Educating Young People About Water: A Guide to Unique Program Strategies*, we placed the programs in the following 10 categories: campaigns, clubs, community service learning, day camps, festival/fairs, museums, nature centers/environmental education centers, organizations, residential camps, and school enrichment programs. We then created definitions (cited in *Educating Young People About Water: A Guide to Unique Program Strategies*) for each category based on commonalities in program design and delivery strategies. Programs listed under each definition vary in location and delivery method. For example, in the community service learning setting, youth may become actively involved in river restoration projects, urban and rural water conservation, or marine conservation. In the club setting, 4-H youth may learn about aquatic habitats through fishing or may experience watershed study using science investigation skills. Our examples of school enrichment settings encourage students to learn through activities on how to integrate a wetland ecosystem into their studies. The nature center example designs an outdoor groundwater adventure trail to educate youth on their drinking water source. And an annual groundwater festival gets 4th–6th graders actively involved in understanding the largest U.S. aquifer, the Ogallala aquifer, that exists right beneath their feet.

Program size and scope

Program design and delivery methods differ among the categories depending on how long youth are with the program, (i.e., day camp versus residential camp or seasonal versus year-round), or whether the program is national or local in scope.

National campaigns such as *Adopt-A-Stream* set broad goals and place heavy emphasis on partnerships, local training and education material distribution. Then it's up to the individual youth facilitator to adapt the national criteria to meet the needs of specific youth groups and the community for water education.

At the local level, programs like *Leap Into Lakes*, an interactive exhibit at the Madison Children's Museum, involves months of fundraising, designing displays and constant maintenance. The reward is seeing thousands of children and adults move through the exhibit and leaving with a heightened awareness of local water issues. By contrast, *Ridges to Rivers*, a 4-H watershed exploration program, represents a common type of water program in the way it's administered—a small, independent group operating on a tiny budget, a few youth facilitators and community volunteers. These smaller programs dot the country and appear as clubs, day camps, nature centers, school enrichment and community service learning programs. Different settings offer youth *choices* in how to get involved, and research (Children and the Environment Survey 1993) shows that youth are more likely to take part in an environmental activity if they can choose **how** to participate.

Common goals

Regardless of size and scope, there are common threads that run through the programs highlighted in *A Guide to Unique Program Strategies* as shown by similarities in their program goals. The desired outcomes for youth range from understanding land and water interactions to enhancing critical thinking skills to discovering themselves and their world. Collectively, these programs hope to prepare young adults to become environmentally aware of their surroundings; to pay close attention to how their daily actions affect water resources. And all these efforts culminate in community action and a willingness to maintain healthy aquatic ecosystems.

For more details about the 37 youth water education programs that contributed to our findings, see *Educating Young People About Water: A Guide to Unique Program Strategies*. Then, meet eight of the coordinators as they share their keys to success and the barriers they hurdle in the video, *Educating Young People About Water: Planning for Fun and Success!* And, if you're ready to start planning a youth water education program or want to enhance a current program, see *Educating Young People About Water: A Guide to Program Planning and Evaluation*.

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Resources in the *Educating Young People About Water* series:

- *A Guide to Unique Program Strategies*. 1995
- *Planning for Fun and Success!* A video. 1995.
- *A Guide to Program Planning and Evaluation*. 1995.
- *A Guide to Goals and Resources*. 2nd ed. 1995.

To order, contact: ERIC Clearinghouse for Mathematics, Science and Environmental Education, 1929 Kenny Road, Columbus, OH 04321. 614/292-6717 or 1-800-276-0462.

Establishing Preschool Programs At EE Centers

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Establishing preschools at community environmental education (EE) centers is suggested as an effective way of making EE opportunities available and effective for young children. While many EE centers currently offer some type of programming for preschool children, in most instances it is limited to individual sessions versus being offered as an on-going preschool program where the same group of children participate on a regular basis (e.g. four or five half days per week over the span of an academic year). There is, however, a strong rationale for establishing such preschool programs at EE centers.

One compelling reason for doing so is based on the fact that many young children are growing up with little direct contact with the natural environment and are developing unfounded fears and prejudices against the world of nature (Bixler, Carlisle, Hammitt, & Floyd 1994; Cohen 1984). When this happens, later environmental education initiatives (e.g. programs for school-age children) tend to be corrective instead of formative (Bixler, et al. 1994). As outlined in the professional literature, for environmental education to be optimally effective, it should be offered as an on-going versus sporadic experience and should begin during the early childhood years (Bixler, et al. 1994; Cohen 1992; Tilbury 1994; Wilson 1994).

Establishing a preschool at a community EE center also offers some distinct advantages to that center. One such advantage is the opportunity for building long-term relationships with the child and his or her family. Parents' environmental ethics and actions are often influenced by their child's enthusiasm and knowledge of ecological concepts, often leading to these parents becoming involved as active members and volunteers for the center (Oltman 1994).

While the concept of establishing preschools at EE centers is not entirely novel, there are currently only a few such programs in existence (Wilson, in press). The development of such programs, however, has been suggested in the recent literature (Bixler, et al. 1994; Wilson in press). Unfortunately, guidelines and suggestions for doing so are not readily available. The following ideas are offered as an initial attempt to address this concern.

Planning

The following questions and issues, likely to surface during the planning stage, warrant careful consideration.

- What group of children should we serve?
- How many children should we serve?
- What type of schedule should we follow?
- Where should we house the program?
- What state licensure requirements must we be aware of?
- What curriculum should we use?
- What should we look for in recruiting teachers?
- How will we fund the program?

A planning committee, consisting of community and center representatives, might be formed to address these questions. Including experts in both environmental education and early childhood education on the committee is crucial. It is also a good idea to include parents and possibly a public school representative.

Special Concerns

A major area of concern related to environmental education programming is the tendency to serve primarily middle and upper middle class white families (Cooper & Smith 1989). A survey of existing early childhood environmental education programs indicates that this concern applies to programs serving preschool children as well (Wilson in press). The fact that environmental education programs tend to serve primarily white families is especially troublesome in that families from minority cultures are disproportionately represented in low-income communities, and that children living in these communities tend to be more exposed to multiple sources of air pollution and the presence of toxic wastes than are children living in predominantly white communities (Harding & Holdren 1993). The result is that children from minority families are **less likely** to have frequent, positive experiences with nature and **more likely** to be affected negatively by their immediate environments than are other children. This situation suggests that EE centers interested in establishing an on-going preschool would do well to make their program readily accessible to children from poor and minority families. It is with this target group that the preschool program may have its greatest impact.

One idea on how to become involved with children from poor and minority families has been presented by Bixler, et al. (1994). They suggest working with Head Start programs to provide "young urban children with positive formative experiences with the out-of-doors before misconceptions are formed" (p. 31). Head Start is a federally-funded compensatory program for economically-disadvantaged preschool children designed to ready them for formal education by giving them the kinds of experiences enjoyed by children from middle-class homes. Head Start classrooms are currently housed in a variety of sites, including churches, public school buildings, and universities. Head Start classrooms could also be housed at community EE centers and offer an environmentally-focused curriculum.

Another area of concern relating to the population served has to do with children with disabilities. Not only does the law require that public programs make appropriate accommodations for children with disabilities (Americans With Disabilities Act, P.L. 101-336), but the inclusion of children with special needs is now considered "best practice" in early childhood education and offers special benefits to the child and the program (Doherty-Derkowski 1995; Safford 1989). A child is considered to have special needs if he or she requires assistance beyond what is normally required by a child of the same age in order to assure the best developmental outcome (Doherty-Derkowski 1995). Conditions typically resulting in a child having special needs include a physical disability, visual and/or hearing impairments, communication problems, a chronic medical condition, a developmental delay, and behavior problems.

Changes in instructional approach and adaptations to materials are sometimes needed when working with children with special needs. For example, some children with physical disabilities may need larger and easier-to-handle tools and other materials. They may also need assistance in stabilizing their materials, especially when working with smaller objects. Ramps, raised flower beds, and hard-surface trails are other considerations that may make the inclusion of children with disabilities a more successful experience.

Preschool programs serving children with special needs can usually look to other community agencies for guidance and support on how best to make appropriate accommodations. In many states, the local school district is the responsible agency for providing educational services to preschool children with special needs. It is not unusual for such services to be provided in community preschool programs versus being housed in elementary schools. Community environmental education centers interested in developing an on-site preschool would do well to contact the local school district for further information about serving young children with special needs.

Curriculum and Schedule

Curriculum

Best practices in early childhood education call for a developmentally appropriate curriculum versus a simplified version of what is offered for school-age children (Bredekamp 1987). Indicators of appropriateness at the early childhood level include: (1) a child-centered versus teacher-directed approach; (2) opportunities for active involvement on the part of the children; (3) an atmosphere that encourages freedom of choice and movement; (4) a focus on social interactions and informal conversations; (5) direct, rather than abstract, learning experiences; and (6) integrated activities that foster the development of the whole child versus a more narrow focus on cognitive or intellectual understandings (Bredekamp 1987; Cohen 1992; Wilson 1993, 1994).

Implementing a developmentally appropriate curriculum depends, to a large extent, on properly trained staff. Just as an appropriate curriculum for preschool children cannot be a simplified version of an elementary curriculum, so providing properly trained staff in an early childhood program requires more than a re-assignment of staff trained to work with school-age children. Educators working with preschool children must have a basic understanding of the nature and characteristics of young children and the ways in which they learn. While some states require a pre-kindergarten or early childhood teaching certificate for working with preschool children, others do not. Information about such requirements are usually available through the state Department of Education.

Schedule

Many preschool programs operate on a school-year (September–May) versus year-round schedule. Such programs may offer an additional summer camp experience, which may include slightly older siblings. Some preschools are built around a two-year program, where the intent is for children to enter when they are three years old and "move up" to the four-year-old group the following year. While the three-year-olds may meet only two or three half days per week, the four-year-olds often meet five half days each week.

In planning the daily schedule for a preschool program, the needs of young children and their way of learning should hold priority over all other concerns. A well-balanced program establishes a flow and rhythm of activities between periods of quiet and active play and offers a variety of experiences in which each child can participate to develop individual skills and self-confidence. A well-balanced program also allows time for both indoor and outdoor play, as well as time for teacher-facilitated group activities and time to play alone, independently or with adult support and guidance. Routine times should be established for eating, resting, and toileting, with enough flexibility to allow for the needs of each child.

Summary

There are many reasons for establishing a preschool program at an EE center—reasons based on both environmental conservation and healthy child development. There are also a number of considerations and issues to address in establishing such programs, including population served and working from a "best practices" approach. While guidelines and suggestions on how to get to started are limited, the resources in the following reference list marked with an asterisk (*) are recommended.

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Learning from a Lake: Development and Assessment of "The Great Salt Lake Story: An Interdisciplinary Activity Guide"

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Introduction

In northeastern Utah, in the western United States, is one of the world's natural wonders. The Great Salt Lake, although but a paltry remnant of its Pleistocene predecessor Lake Bonneville, is nonetheless still large enough to appear on a globe and in satellite photos of the Earth. Visitors from around the world go to marvel at the lake, and to float in its salty brine. To most Utah residents, however, the Great Salt Lake is just a smelly, muddy wasteland—pretty to look at from a distance, but a place to be avoided. There is little understanding of the lake as a unique ecosystem, and little appreciation of the role it plays in our everyday lives.

The Great Salt Lake Curriculum Project was born out of concern over this ignorance. In the spring of 1993, I was approached by the Utah Museum of Natural History to develop and facilitate a teacher workshop about the Great Salt Lake. As I was preparing for the workshop it occurred to me that the lake constitutes an ideal local laboratory that Utah schools could use to integrate, rather than compartmentalize, various aspects of the core curriculum standards mandated by the Utah State Board of Education. Although there are many published materials about the Lake, there was no single handbook or program that teachers could use to teach Utah students about this outstanding resource. A proposal to develop a curriculum guide to help fill this gap was met with enthusiasm by the Museum.

Goals

The proposed project had two main goals. one was to increase student awareness of the Lake as a valuable natural resource that needs protection. The second goal was to help Utah teachers use the Lake as a unifying theme to make general science, social studies, and environmental concepts more relevant to their students.

Project Evaluation

In a voluntary program such as this, it is difficult to employ many formal evaluation models that involve quantitative techniques. Teachers choose to take the workshop and use the materials because of their own internal motivations. Therefore, it is impossible to get random groups for testing and evaluation. There is a built-in bias based on participant self-selection. Nevertheless, a number of qualitative evaluation techniques (both formative and summative) were found to be applicable and useful as the project progressed. These will be noted in the sections on program design and field testing.

Program Design

In order to reach the stated goals, three major objectives were identified:

1. Development of a curriculum guide with background information about various aspects of the Great Salt Lake, and activity-based lesson plans that could be used to teach relevant concepts.
2. Creation of resource kits with reference materials and supplies for the lake study activities detailed in the guide.

3. Presentation of a series of workshops to introduce teachers to the guide, and to provide them with opportunities to learn more about the Great Salt Lake.

At the beginning of the project I was chosen to act as project coordinator to oversee the development and testing of the curriculum. Two working groups were formed—an advisory committee and a writing team. The advisory committee was made up of professionals in the fields of geology, geography, biology, water chemistry, archaeology, history, lake industries, and education. Their function was to oversee the accuracy of the content material (expertise-oriented evaluation). The writing team was composed of classroom teachers who could ensure that the material was presented in a useful and effective way (participant-oriented evaluation). These teachers had all participated in a multi-part workshop about the lake, and were familiar with the subject before starting the project.

After a review of the state science and social studies core curriculum standards and a literature search, the project coordinator developed an outline of the concepts and unifying themes to be covered in the guide. This outline was reviewed and evaluated by the advisory committee and the writing team, and then revised by the coordinator based on the feedback.

After the outline was revised the writing team developed activity ideas with concepts, goals, and objectives. (The use of measurable objectives in the activities provides a goal-based method of evaluating student learning of content). The team met with the project coordinator to discuss and evaluate these ideas. Key points considered were how the activities related to the core curriculum standards, and how to the different activities could be linked to each other. The writing team asked themselves specific questions: what subjects and skills can be taught with this activity? Can a teacher use this activity to go from a specific idea to a general concept? The team members then wrote the lesson plans, using a standard format. The lesson plans were again reviewed and evaluated by the entire team.

During the editing phase the project coordinator looked for unifying themes to tie the activities together, did extensive rewrites of some of the activities, wrote introductions to each chapter, and developed additional activities to fill in the gaps. After editing, the first draft of the guide was reviewed and critiqued by the advisory committee and the writing team. It was revised once more before beginning the field testing phase of the project. During the writing process qualitative formative evaluation was done primarily by means of discussion and open-ended written comments.

The final draft consisted of twelve chapter covering geography, geology, water, weather, biology, prehistory, history, geologic hazards, lake industries, modern lake use issues, and field trip suggestions.

Field testing

Four workshops were presented, which were attended by a total of 79 teachers. The workshops introduced teachers to the guide, and gave them a chance to try some of the activities. After each workshop the teachers were asked to use at least three of the activities with their students. For each activity, they filled out a questionnaire about the activity and their students' reactions. This questionnaire involved the teachers in evaluating the student learning (expertise-oriented evaluation, both goal-based and goal-free), as well as in assessing the clarity and helpfulness of the guide (participant-oriented). The guide was further revised on the basis of these evaluations.

Evaluation Results

The results of the teacher evaluations showed a clear pattern of initial success, especially as used by teachers in grades four and seven. Natural and human history of Utah is studied in those grades, which probably helps to account for their high use of the curriculum.

The evaluation results needed to be interpreted with caution. The sample sizes were too small for the numbers to have statistical validity. Fifth grade results provided a good example—only one teacher from this grade level participated in the program. The reason for this is unclear as many of the activities address core science requirements for that grade. In other cases, a particular activity was tried by only one teacher who may have given it a rating of ten. It is worth noting, however, that the activities that were tested by the most teachers still received a high average ranking.

Some teachers rated an activity low not because there was a problem with the activity, but because it was not suitable for their grade level. The guide was written primarily for grades four through nine, but the activities were tested by classes ranging from kindergarten through grade eleven.

The written comments on the evaluation forms gave more insight into the effectiveness of the curriculum. There was uniform agreement that the activities were effective in teaching the stated concepts. Teachers gave overall praise for the way the activities related to things they already teach, how well they fit the core curriculum standards, and how they made the concepts more relevant to the students. A high student interest and participation level was also noted.

While there was consensus that the directions were generally clear and easy to follow, there was some constructive criticism aimed at points of confusion in some of the activities. Other criticism was mainly concerned with appropriateness for certain grade levels, the need for a glossary, and the desire for illustrations. Most of these concerns were dealt with in subsequent revisions. The teachers also had a number of good suggestions for adaptations and extensions to many of the activities. Where possible, these were also incorporated into the final version. A glossary, metric conversion table, and illustrations were also added.

Future Evaluation and Revision

The initial evaluation work focused on the effectiveness of the individual activities in the guide. In order to analyze how well the stated project goals (increasing student awareness and helping teachers use the Great Salt Lake as a unifying theme) are being met a long-term evaluation needs to be developed. Follow-up surveys of teachers and students could be conducted in one or two years. This could help determine whether or not the curriculum is being used on a regular basis, how it is being used, and what impact it is having on student learning and attitudes.

A Framework for Environmental "Risk" Education: Select Results from a Needs Assessment

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Background

Every day we make decisions that involve risk. Often, however, we do not base these decisions on quantitative estimates of the size, magnitude or probability of the risk but rather on our perceptions of the risk. Perceptions associated with a risk, such as the extent to which the risk is unknown and/or dreaded, cause us to overestimate small risks or underestimate or even ignore large risks (Slovic 1987). In the interest of societal welfare and the quality of our environment, a need has been recognized to improve individuals' risk decision making ability and formal education has been identified as one way to produce a risk literate citizenry (Baron and Brown 1991; Briscoe 1992; Yates 1992; Riechard 1994).

Risk education could be incorporated in a variety of school curricula such as health, mathematics and social studies. However, the integration of risk education in science curricula seems particularly appropriate because the probabilistic and interdisciplinary nature of risk decisions lends itself to the investigation of a variety of scientific issues. Also, recent national science education reform standards explicitly identified teaching about risk as an important goal for science education (American Association for the Advancement of Science 1993; National Research Council 1994). As the successful incorporation of risk education into science curricula depends on teachers who are willing and able to teach about decisions involving risk, we designed a study to assess grades 6–12 science teachers' needs with regard to incorporating this topic in their classrooms.

Needs Assessment Methods & Mail Questionnaire Results

Initially, personal interviews and focus groups were conducted with 102 Michigan, Ohio and Wisconsin science teachers. Teachers' attitudes toward risk education and the barriers they perceived to integrating risk education into their curricula were discussed. This information was used to guide hypothesis formulation and development of a mail survey. After science teacher names and school addresses of grades 6–12 were obtained from the three respective state departments of education, 2,832 questionnaires were disseminated to these individuals following a modified version of the Dillman (1978) total design method (i.e., an initial questionnaire, a postcard reminder and a second questionnaire). Usable surveys were received from 1,334 individuals (47% response rate). Adjusting for noneligible respondents (i.e., individuals who did not teach science during the 1994-1995 school year), the response rate was 48%. Results from a follow-up nonresponse survey suggested that many unreturned surveys were attributed to recipients who were not eligible science teachers. Thus, the actual response rate could be as high as 80% of actual science teachers in the sample.

Results from the mail questionnaire suggested that teachers were very interested in risk education (73% currently integrated risk education in their classrooms, and 70% wanted to teach more about the topic). The main perceived barriers to incorporating risk education were a lack of awareness of appropriate materials (61% were aware of none) and a lack of training (80% had never participated in a related inservice). Importantly, 83% of the teachers indicated that they would be extremely likely or likely to attend an in-service on risk education. Teachers interested in increasing their risk education efforts were also more likely to belong to professional science or environmental education organizations (56% of the interested teachers were members). Risk education information could therefore be disseminated to interested teachers through these organizations.

As the Great Lakes region has environmental and health issues that can be applied to teaching about decisions involving risk, the questionnaire also collected information on respondents' current Great Lakes education practices and their interest in teaching more about the Great Lakes. Fifty-two percent of the respondents indicated that they taught about the Great Lakes, and 87% were interested in teaching more about the Great Lakes. This suggested that risk education materials framed in a Great Lakes context could be of interest to teachers in Michigan, Ohio and Wisconsin. In sum, the mail questionnaire results suggested that a majority of science teacher thought risk education should be incorporated in their curricula but that it would require training and materials.

Follow-up Interview Methods & Results

The mail questionnaire provided information only on teachers' general risk education practices and interests. To determine teachers' specific practices and future interests with regard to risk education, a series of follow-up telephone interviews were conducted.

These interviews were structured around a risk education framework developed from a synthesis of the risk literature and reviewed by 40 experts in risk, decision making, and science or environmental education. The framework consisted of ten risk education objectives (Table 1) and a description of each objective. About one to three weeks in advance of the interview, 50 of the teachers who had responded to the mail questionnaire received this framework. Only teachers who had read the material in advance were interviewed, and 45 of 50 interviews were completed (90% response rate).

Of the 50 teachers, 35 were selected to represent a group of teachers highly involved in risk education. High involvement teachers were defined as those who taught about decisions involving risk, were members in teacher organizations, and had participated in a risk education related inservice. The other 15 teachers were selected to represent a less involved group. These low involvement teachers were defined as those who did not teach about decisions involving risk, were not members in teacher organizations, and had not participated in a risk education related inservice. These two groups were selected to assess the validity of the measures used to determine teachers' past risk education practices in the mail questionnaire and to determine if there were any differences in the groups' interests with regard to teaching about decisions involving risk in the future.

First, the teachers were asked if they had ever strived to achieve the ten risk education objectives with their students. As expected, most teachers in the high involvement group had strived to achieve each objective either directly or indirectly, whereas most teachers in the low involvement group had strived to achieve each objective either indirectly or not at all (Table 2).

Significant differences occurred between the high and low involvement groups for all but three objectives (i.e., the objectives that focus on judgement bias, perceptions of risk characteristics and taking action). Second, teachers were asked how interested they were in striving towards each of the ten objectives in the future. Teachers in the high involvement group tended to report greater levels of interest for each objective than teachers in the low involvement group (Table 3). No significant differences were found between the high and low involvement groups for four of the ten objectives (i.e., the objectives that focus on decision making, risk assessment, and perceptions of risk characteristics). Lastly, teachers were asked how interested they were in materials that combined teaching about decisions involving risk and the Great Lakes. Eighty-seven percent of the teachers indicated that they were interested in such materials.

Conclusion and Recommendations

A majority of Michigan, Ohio and Wisconsin grades 6–12 science educators incorporated some level of risk education in their classrooms. However, even teachers who were very involved in risk education explicitly strived for only five of the ten risk education objectives. Teachers' overall effectiveness as risk educators was questionable not only because they strived toward a limited number of risk education objectives but also because they lacked appropriate training and materials.

Fortunately, interest in increasing overall risk education efforts was high among most teachers. All teachers expressed a strong interest in teaching more about how perceptions influence decisions involving risk and the science of risk assessment. Also, for teachers in Michigan, Ohio and Wisconsin risk education materials or programs in a Great Lakes context would be of special interest. Free inservice programs that disseminate such risk education materials should draw a substantial number of teachers. Disseminating information on such risk education materials and programs through professional science, or environmental education teacher organizations at the national, state, or local chapter level is recommended given results that teachers who are most interested in risk education were also more likely to belong to these organizations.

Finally, the risk education framework with its ten objectives appears useful as a guide for developing appropriate programs and materials. Teachers who participated in the follow-up phone interviews indicated that they were able to understand the information presented in the framework and that it served as a good basis for questioning.

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Table 1 - Risk education objectives.

When confronted with a decision involving risk students should be able to ...

1. follow a thoughtful (rather than automatic) decision making process.
2. evaluate the benefits and limitations of the approach selected to assess the type and size of the risk.
3. interpret the size of the risk.
4. evaluate how mass media are affecting perceptions (of self and others) of the risk, and if appropriate, control this influence.
5. evaluate how opinions and behaviors of others are affecting perceptions (of self and others) of the risk and, if appropriate, control this influence.
6. evaluate how personal biases affect perceptions (of self and others) of the risk and, if appropriate, control this influence.
7. evaluate how characteristics of the risk affecting perceptions (of self and others) of the risk, and if appropriate, control this influence.
8. evaluate how perceptions of the risk are affecting perceptions (of self and others) of associated benefits, and if appropriate, control this influence.
9. identify sources that can provide information about the risk, they should be able to get information about the risk, determine how trustworthy the information is, and use it appropriately.
10. identify what agencies, organizations or groups are involved in managing the risk; they should be able to identify what opportunities exist to influence these agencies, organizations and groups, and participate in the management of the risk.

Table 2 - High and low involvement teachers' efforts to achieve each risk education objective.

RISK EDUCATION OBJECTIVE	HIGH INVOLVEMENT TEACHERS			LOW INVOLVEMENT TEACHERS		
	Definitely Strived For (%)	Strived For But Indirectly (%)	Not Strived For (%)	Definitely Strived For (%)	Strived For But Indirectly (%)	Not Strived For (%)
1. Decision Making *	33	62	6	9	54	35
2. Risk Assessment *	35	35	29	9	18	73
3. Mathematics *	59	21	21	18	27	54
4. Perceptions-Mass Media *	47	44	9	18	27	54
5. Perceptions-Others *	38	47	15	0	18	82
6. Judgement Bias	26	41	32	9	18	73
7. Perceptions-Risk Character.	15	44	41	9	36	54
8. Perceptions-Benefits *	12	59	29	9	36	54
9. Information *	68	18	15	9	54	36
10. Action	59	21	21	9	9	82

* Chi-square analysis of frequencies indicates significant difference ($p \leq 0.05$).

Table 3 - Average interest (1=very interested to 4=not at all interested) in striving toward each risk education objective for high and low involvement teachers.

RISK EDUCATION OBJECTIVE	HIGH INVOLVEMENT TEACHERS	LOW INVOLVEMENT TEACHERS
1. Decision Making	1.8	1.9
2. Risk Assessment	2.0	2.6
3. Mathematics	2.0	2.3
4. Perceptions-Mass Media *	1.6	2.4
5. Perceptions-Others *	1.8	2.9
6. Judgement Bias *	2.0	2.6
7. Perceptions-Risk Character.	2.1	2.6
8. Perceptions-Benefits *	2.0	2.6
9. Information *	1.5	2.0
10. Action *	1.6	2.6

* Independent sample t-test and Mann-Whitney analysis of means indicate significant difference ($p \leq 0.05$).

NAAEE Background

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Finally, we'd like to thank the following organizations, who have supported this conference with their outstanding contributions of staff time, resources, and in-kind services. Without their support, this conference would not have been possible.

Bates College, Lewiston, Maine
The Chewonki Foundation, Wiscasset, Maine
Coyote Point Museum for Environmental Education, San Mateo, California
Maine Audubon Society, Falmouth, Maine
National Association of Conservation Districts, League City, Texas
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- Mary Brandwein
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1984	John F. Disinger, The Ohio State University-Columbus, OH
1985	David L. Hanselman, State Univ. of NY College of Environmental Science and Forestry, Syracuse, NY
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1987	William B. Stapp, University of MI, Ann Arbor, MI
1988	Robert E. Roth, The Ohio State University-Columbus, OH
1989	Lillabelle Holt, University of AK
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1991	Joan C. Heidelberg, Brukner Nature Center, Troy, OH
1992	Richard Wilke, University of Wisconsin-Stevens Point, WI
1993	Rick Mrazek, University of Lethbridge, AB, Canada
1994	John Judy, TVA, Knoxville, TN
1995	Augusto (Gus) Medina, formerly World Wildlife Fund-US and Canada

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1981	Thomas F. Williams, Consultant, Environmental Affairs
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1983	Steven E. Landfried, Stoughton High School, WI
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1985	Paul F. Brandwein, Unionville, NY
1986	--
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1988	James Murray
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1993	Lynne Cherry, Washington, DC
1994	Karen Armstrong-Cummings, KY Nat. Res's & Env'l Protection Cabinet/KY Env'l Council, formerly w/Council of State Gov'ts; Lexington, KY
1995	Vern Fridley, Jr., Utah Society for EE, Salt Lake City, UT Richard Wheeler, Great Auk Project of QLF/ACE, Ipswich, MA

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1976	--
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1978	League of Women Voters Education Fund
1979	Journal of Environmental Education
1980	ERIC Clearinghouse for Science, Mathematics, and Environmental Education
1981	Environmental Education Association of SD
1982	--
1983	Michigan Environmental Education Association
1984	Western Regional Environmental Education Council
1985	National Wildlife Federation

1986	Project WIZE (Wildlife Inquiry through Zoo Education), NY Zoological Society
1987	Kentucky Division of Water
1988	Wisconsin Department of Public Instruction
1989	Tennessee Valley Authority, Environmental Education Program
1990	Alberta Environment, Env'l Ed Branch, Canada
1991	WSMT TV Channel 4, Nashville, TN
1992	Profauna (Protección de la Fauna), Mexico
1993	Boys & Girls Clubs of America
1994	Phillips Petroleum Company
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	Council of State Governments' Center for the Environment, Lexington, KY

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1990	Thomas Tanner, Boone, IA
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1992	Rosanne Fortner, The Ohio State University, OH
1993	Paul Hart, University of Saskatchewan, Regina, SK, Canada
1994	Tom Marcinkowski, Florida Institute of Technology, Melbourne, FL
1995	Trudi Volk, Southern Illinois University, Carbondale, IL

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1989	Joan C. Heidelberg, Executive Vice President, NAAEE
1990	Senator Gaylord Nelson, Father of Earth Day
1991	Dr. Harold Hungerford, Southern Illinois University, Carbondale, IL
1992	Janet Thoreen, NAAEE Administrative Assistant, Pleasant Hill, OH
1993	Andriy Demydenko, EE & Information Center of the Ukraine
1994	David Wicks, Black Acre State Nature Preserve, Louisville, KY
1995	Brenton S. Halsey, Jr., James River Corporation, (awarded posthumously to his wife Corelle and baby Christian)

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1995	Colorado Association for Environmental Education

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1996-97	Peter Corcoran, Bates College, Lewiston, ME

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1972	Hot Springs, AR
1973	St. Louis, MO
1974	San Francisco, CA; Environmental Education: The Challenge and the Commitment
1975	New Orleans, LA; Improving the Quality of Life through the Better Use of Energy and Resources
1976	Atlanta, GA; New Values for a New Century
1977	Estes Park; CO
1978	Chicago, IL; Energy and the Urban Environment
1979	Blacksburg, VA; Environmental Education Today, Tomorrow, Together
1980	Albuquerque, NM; An Environmental Agenda for the Eighties
1981	Kentucky Dam Village State Park, KY; Environment, Education, Technology
1982	Silver Bay, NY; Global 2000; Which Path to the Future?
1983	Ypsilanti, MI; Crossroads: Society and Technology
1984	Lake Louise, AB, Canada; International Perspectives on Environmental Education: Issues and Actions
1985	Chevy Chase, MD; Environmental Education: Progress Toward a Sustainable Future
1986	Eugene, OR; Environmental Education: Transition to an Information Age
1987	Quebec City, PQ, Canada; Excellence in Environmental Education: Gaining Momentum for the Challenge Ahead
1988	Orlando, FL; Building Multicultural Webs through Environmental Education
1989	Estes Park; CO; Working Together to Educate about the Environment
1990	San Antonio, TX; Setting the EE Agenda for the '90s
1991	St. Paul, MN; Confronting Environmental Challenges in a Changing World
1992	Toronto, ON, Canada; World Congress on Environment and Development, ECO-ED
1993	Big Sky, MT; Pathways to Partnerships: Coalitions for Environmental Education
1994	Cancún, QR, Mexico; Collaboration and Opportunity in North America: Energy Through Diversity
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1996	Burlingame, CA
1997	Vancouver, BC, Canada;
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